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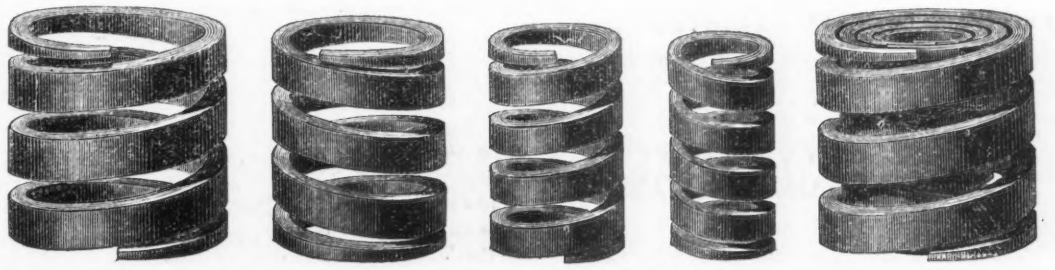
IMPROVED RAILROAD CAR SPRINGS.

The application of springs to carriages is of comparatively modern date. In ancient sculptures representing chariots, carriages and carts, no springs are ever seen, so that whatever may have been the practice in early times in regard to pleasure carriages, it is certain that the vehicles used in war and those chariots which formed such a prominent feature in the ancient games were without springs. At first the devices which were used for the purpose of moderating the excessive jolting caused by rough roads were exceedingly rude. A couple of stout leather straps or a pair of elastic wooden poles were the first aids in this direction. The substitution of steel springs for these poles was one of the earliest noticeable steps in this process of improvement, and even at this day the old-fashioned C spring, as it is called, is not uncommon. For light vehicles the elliptic spring, which is a comparatively modern invention, has in a great measure taken the place of all other forms; and even for carriages of the heaviest class, such as railroad cars, locomotives, and the like, it has not been found inefficient. The discovery of india-rubber gave a new direction to the efforts of inventors, and as soon as the process of vulcanizing it had been perfected, the application to springs of the new material thus created was not long deferred. In a very few years, the majority of all the springs in use were formed of vulcanized rubber. But notwithstanding the almost universal adoption of rubber as a material for springs, very strong objections to it were raised, constant spasmodic efforts to find a substitute were made, and men ransacked the three kingdoms of nature to find a material which would prove superior to it. At one time that most perfectly elastic of all the forms of matter —air—was called to the aid of the manufacturer of springs. At one time it was compressed in an air-tight cylinder by means of a piston, and at another the air was pumped under great pressure into air-tight vessels of a lenticular form, the pressing together of the sides of these lense-shaped vessels being thus resisted not only by the metal but by the air within. Other inventors sought to find in the animal kingdom a substitute for rubber, air and metals. But of all the materials thus far substituted, good steel, well manufactured, has given the best results. It is true that when badly tempered it either sets under excessive pressure or breaks during the ordinary course of service, and even if, under ordinary circumstances, it should withstand the usual strain, it is very apt to break when used at excessively low temperatures. This, however, is not a necessary feature of good steel, and the difference between first-class steel, properly worked, and poor steel, or even good steel badly worked, is such that while the one is absolutely worthless the other will withstand any amount of legitimate hard work. A striking instance of this came under our observation a few years ago. During the exploration of Alaska, the gentlemen composing the expedition were frequently exposed to most intense cold. It was found that the lock springs of the firearms usually furnished in this country even by the best makers became entirely worthless, and broke with little or no apparent cause, while the springs of the arms furnished by the Hudson Bay Company, and made expressly for this region, were not only excellent in moderate climates but remained undeteriorated during exposure to the most severe cold. In order to utilize the wonderful elasticity of steel, a great number of forms have been devised. The old C spring, the plate spring, the elliptic spring, and several others, are in common use. Less often seen, but quite as familiar to the engineer, are the volute spring, the disc spring, and that very excellent spring which is formed by packing a spiral of highly tempered steel wire with wool. But after a careful examination of all these various forms, it seems to us that the most simple and efficient form of steel spring is that invented by HEBARD ONDERDONK and illustrated in the cuts which we herewith present. This spring is formed of any number of spirals placed one within the other, each spiral being wound in a direction the reverse of that taken by the spirals next to it. This will be more clearly understood from an inspection of Fig. 1, which illustrates the four different sections of one spring, as seen when taken apart; the whole forming a nest in which each spring is shorter than its immediate predecessor. In Fig. 2 is shown the complete spring, with the four separate spirals in place. Springs of this form are made of any size and of any power. They have been used during the last three winters on the Boston and Albany Railroad, where they have been exposed to severe changes of temperature, and the most trying conditions as to grades and other features incidental to a rough and hilly country. Yet, on this road they have given the most perfect satisfaction, and have worked their way on to other roads, such as the New York Central, Boston & Lowel, Chicago, Burlington & Quincy, Central Pacific, etc. This excellence they owe to their simplicity and directness of action, and to the superiority of the material and workmanship employed. There is no possibility of their clogging, as has sometimes been the case with spiral springs packed with wool, hair, rubber and other substances. And as none but the very best quality of steel, from the Farst steel works, Windsor, Conn., is used, and that is most carefully manufactured, the result is unexceptionable.

The factory in which these springs are manufactured is at present located in Springfield, Mass., but the general agent for the United States is Mr. WASHBURN, whose establishment is to be found at 137 Elm street, N. Y. Springs are furnished of any size, and suitable for application to body, wheel or buffer. They require little or no special adaptation, but can be applied with the greatest ease to any form of railroad car now in use.



IMPROVED RAILROAD CAR SPRINGS.

Railway Travel Abroad.

CLARK BELL, the accomplished attorney of the Union Pacific Railroad Company, thus writes in the Cooperstown *Republican and Democrat*:—

"If in America the engineer has most renown who constructs a railway over the most difficult routes and passes at the least expense, in France, and I think indeed in every country in Europe, it would seem to have been the central idea of the engineer to see how much money he could possibly expend in the construction of a railway and not be chargeable with direct waste. A tunnel on continental railways is an engineer's favorite, his pet and hobby. He does not consider how he may avoid it, but he inevitably builds one wherever there is an opportunity. From Havre to Paris, following a river and over a fair country, tunnel after tunnel is built, and of the most expensive kind, when all, or nearly so could have, and in this country would certainly have been avoided. Bridges over inferior and remote streams are the most expensive and complete structures that can be devised, of solid masonry and of the very best kind, while the ballasting of a road-bed is carried to the very last extent possible. However this policy may affect stockholders in England and continental railways, it certainly has very good and beneficial results for the general public, as it renders the road as secure from danger by reason of accidents as it is possible for them to be, and reduces the risk of travel very, very far below the standard on American railways. It is true that the railways of Europe are much more carefully and completely constructed than our own, and this is also as noticeable in the very great expense given to the erection of stations.

"In Paris the railway stations are among the most beautiful of the city, and the same may be truthfully said of every continental city that I visited, as well as London and of most of the prominent cities of Great Britain. In the equipment of their roads the difference is more marked and the difference very much in favor of our own system. Take a French railway for example. Their locomotive is much smaller than our own, and has no protection for the engineer except a simple breastwork with two round windows of glass, one on either side, to keep the rain or storm out of his eyes as the train dashes along, but is wholly destitute of any cover to protect him from the storm. The passenger carriages are of three classes: First class, second and third, with a different price for each. The "wagons," as the cars are called, have a door on each side, facing the platform, with a seat crosswise of the car, so that eight people fill a car, sitting facing each other, four riding forwards and four backwards, with a slight division in the center of each seat, so that the four passengers who occupy the four inside seats may rest their heads against it, while the four outside seats give a corner to the head of each of the four occupants. These first-class carriages are upholstered in broadcloth, plush, or leather, and have a carpet or rug on the floor; but there is no ventilation whatever, and you are obliged to ride either hermetically sealed in your car or to let a window down, as each door of the car (one on either side) has a window which lets down with a strap exactly like the window of a close carriage at home, in a panel of the door.

"No old traveler in America thinks of letting a window down, even in summer, as the arrangements for ventilation on our first class roads are perfect without it; but it is universal abroad to ride with your window let down and you are of course deluged with dust and smoke and covered with dirt. A light is made at night for you by a lamp lighted from above a circular glass window in the center of the ceiling of the carriage, but which is rarely of sufficient power to enable you to read. On the continent, but not in England, a curtain is made to be drawn at your pleasure over this light, if you wish to sleep at night. Sometimes the car consists of single wagons, being only one of these eight-seated compartments, but in many places in Europe three of these compartments are united in the same car, in no wise communicating with each other. Along the side of each car, and about eighteen or twenty inches below its floor, is a board which, fastened the whole length of the car, serves as a step on entering or alighting from the train for the guard to pass outside from one car to another. The door of each wagon is fastened by the guard (and in England) locked before the train starts, and opened at every station by the guard there stationed.

"The second class car is like the first in construction, but differs in the upholstery and fitting up. They usually have a cushion for seat and back, but have, as a rule, no carpet or rug, and the material of the cushions is not as expensive, and the carriages do not look, and are not kept as clean as the first class. The third class resemble the others in construction but are not cushioned at all, and the seats are of plain board, without cushions, rugs or upholstery of any kind. There is no conductor on the train who collects fare as in our system, and no passing from one car to another when the train is in motion. There is an officer who rides in a high covered seat on the top of one of the forward cars, to which he ascends by a staircase. In France, or England, he does not pass along the train on the outside step while it is in motion, but is seen only when the train stops. In Germany, however, he does, and goes from one car to another on the outside step, clinging like a monkey to a hand rail, and talks to you through the open window, which must be let down in all weather, as the door cannot be opened.

"As a rule there is no signal rope connecting with the engine, but I saw two exceptions to this abroad, both lately put on by reason of the popular clamor, on account of its absence resulting in serious results in England, which created great excitement. The first exception was on a French railway between Paris and Calais, and was a glass window in the partition, between the compartments, with a notice printed in English, French and German, to the effect that any passenger could, in a great emergency, break this glass window with the elbow, and pull a small ring, which would signal the driver to stop the engine, but a notice that if it was decided that the passenger did this without a good and sufficient reason he should pay all damages sustained by reason of the stopping of the train. The other exception I saw on an English railway—a cord, as with us, running the whole length of the train, communicating with the engine, but placed under the carriage and along the step, and where a passenger, locked in the wagon, could by no possibility reach it in an emergency. As you arrive at a station an officer appears, who takes and punches your ticket, and the passenger must have a ticket before he can enter the railway station, or gain access to or egress from the cars. The roads are not left open at the depots as ours are, but are always enclosed, and it is in all these countries impossible to get in or upon the inner platform or out of a railway station, except past an officer who sees and examines your ticket.

"The price of travel in Europe is very high as contrasted with our own. The usual third class price is in gold about the amount charged here for way passengers in currency. The first-class fare is always exactly double, the third-class and the second-class at some intermediate point between the two. Such a thing as a sleeping car is wholly unknown in any of the countries in Europe that I visited, and an American accustomed to all the conveniences and luxuries, on our first-class cars, finds travel on continental roads very disagreeable. Such an idea as ice-water, washing places, water-closets or smoking-cars on a train have never entered their heads.

"The speed of trains on the continent is much the same as our own best through lines, except some particular trains running to and from prominent places or capitals, when a much higher rate of speed is attained than with us. In England, however universally trains are run at rates that we never equal, and some of their trains, as for instance, the Scotch limited mail, from London to Edinburgh, runs by schedule time sixty miles an hour, including stoppages, and takes water, as I was told by the officials by some process while the train was in motion. I frequently rode at the rate of fifty miles an hour on through express trains in England.

"There is a wide difference in the different countries in Europe in the quality of their cars, as for instance in all Germany, Austria, Prussia, Bavaria, and indeed wherever the German language is spoken, a second-class car is much better and more comfortable, than in any of the other countries. The German second-class car is precisely as comfortable as the first-class car, though not as costly in its upholstery. In Bavaria, a second-class carriage is more clean and comfortable than a French or English first-class carriage, at least this was my experience, and of all those with whom I conversed. The Bavarian roads are managed by the government. Foreigners say that 'none but Princes, Americans and fools ride in first-class carriages,' while it is quite true that Americans do usually travel in first-class in England, France and Italy, they not unfrequently choose second class carriages in German countries.

"Everywhere upon the continent the baggage system in use is as follows: You first purchase your ticket on entering the outer hall of the depot. You then hand this ticket through another window where an officer stands, who, when the porter has put your luggage in the scales and the weight is announced, registers its weight, number of pieces and amount charged in a duplicate coupon book, and hands you the coupon counterpart cut out of the book like a check, on receipt of the amount charged. This paper check is precisely as safe as our metal one, although it does not seem so to us, and is much more troublesome, both for the company and the traveler; but while this system is universal on the continent, England is destitute of any baggage system whatever, and traveling there, so far as luggage is concerned, is simply abominable. In England you must see with your own eye that your luggage goes on the train, and that when you stop it is taken off. You must also watch to see that it does not come off before you reach your place of destination, and at every change of routes you must see personally to its change. The porters always hand you the pieces you claim, so that any thief in England could get your trunk off at any station if he was a passenger, by only claiming it, running only the risk of the passenger catching him, who is certain to be on the train and certain to have a sharp eye out for his luggage if he is an old traveler.

"You are struck in France, and indeed everywhere abroad by the apparent police system of the railways. The officials demand and receive the same respect and obedience as the police. You *may* do this, and you *must* do that, and you *cannot* do the other thing. You need not talk about it. Remonstrance is never heard and would do only harm and no good. There is no confusion, no disturbances, no loud talking or controversies, all quiet, and as firm as military rule. It must be conceded, however, that these arbitrary regulations have all been adopted after long trial, and are unquestionably best for the safety of the passenger. Accidents are therefore very rare, and travel very safe indeed. We have no conception of the enormous traffic of some of the French and English railways. The number of trains run daily over a road is something extraordinary. It was stated to me by Mr. Fairlie, one of the leading English engineers, that there was a certain point in London where a train of cars passed a given point once in every three minutes of time during the day. The switchmen on the English railways are men of much higher intelligence than those we employ. I remember seeing a superintendent of switches at an important point, where the lines to all the different switches were in a row, and inside a house over twelve feet high, surrounded with glass, so that the officer could see in every direction, and stood in front of these handles arranging each switch and its signal as the train approached, and the officer was a man of intelligence who would have been competent here for assistant superintendent of a division. For security and speed they excel us abroad as far as we excel them in comfort, luxury, and cheapness of travel at home.

[WRITTEN FOR THE AMERICAN JOURNAL OF MINING.]

THE CHEMICAL OPERATIONS—XV.

BY PROF. G. HINRICHS, OF THE IOWA STATE UNIVERSITY.

MECHANICAL OPERATIONS.

126. Besides the operations enumerated in the preceding pages, there are several mechanical operations of the highest importance to chemists. These are the various modes of *division*, *weighing* and *measuring*.

23. DIVISION.

127. This operation is not usually considered a chemical one; but it is undoubtedly as much so as decantation, filtration, fusion, etc. But whether belonging here or not, the operation is very important to the chemist, for upon a thorough pulverization of the solid to be acted upon, the success of all the subsequent operations often depends.

128. Most solids are readily broken into smaller fragments by a few strokes of the hammer. In order to prevent the fragments from flying away, and to guard against the introduction of impurities, it is best to wrap the solid to be crushed in clean, strong writing paper.

The fragments thus obtained are pulverized in a mortar. A great many substances are not harder than good porcelain, and these are pulverized in porcelain mortars, which are best unglazed on the inside. Very hard substances require the much more expensive agate mortars, because they would grind off much of the material of the porcelain. Some very hard substances, such as quartz, cannot be pulverized even in an agate mortar until they have been crushed to a pretty fine powder. To obtain this most easily, the steel or diamond mortar is used. This mortar consists of three pieces of good, hard steel; the base has a small depression exactly fitting the ring, while the pestle fits very accurately into the ring. For the escape of the air from under the pestle a small canal is filed into the ring on its outer and lower side. For use, the ring is put into the base, a few grains of the substance to be crushed are thrown in, the pestle is inserted, and then beaten down by a few smart blows with a hammer. The powder thus obtained is ground in the agate mortar.

It is essential to grind the substance to an impalpable powder, and the harder the substance the more important is this operation, for in general the harder substances are less readily acted on by chemicals.

129. When the substance to be worked upon is a clay or a soil it is customary not only to pulverize it, but also to separate the finer from the coarser particles by elutriation. The pulverized substance is rinsed with water into a glass, and permitted to settle after having been thoroughly stirred up. The coarse particles will settle first, forming a layer near the bottom, while the finer particles are still in suspension, and may easily be separated from the coarse particles by decanting the turbid liquid. By pouring more water upon the coarse particles, and again stirring, another portion of somewhat less fine particles may be decanted. The finer particles settle to the bottom in the vessels containing the decanted liquids, and by filtration (or decantation) and drying they are obtained ready for use. Many ingenious apparatus have been invented for this process; that of SCHONE is the best.*

* This process has been and is being applied in nature on a stupendous scale by natural waters, rain, rivers, lakes and ocean. The larger stones are found near the head waters; gravel is carried further, while sand goes to the mouth of the rivers, and the finest clay even passes into the sea. Gold washing is conducted on the same principle.

130. Two most important properties of matter modify the process of pulverization, and at the same time afford characteristic features for the different substances. These two properties are *cleavage* and *malleability*; the former is peculiar to crystallized substances, the latter to the metals.

131. *Calcite* or *calcareous spar* shows *a most perfect* cleavage in three directions. This substance is easily obtained in most limestone quarries, filling more or less the crevices in the limestone. It exhibits a very great number of most beautiful and regular crystalline forms, four of which are represented in Figs. 60, 63. Fig. 60 is the *rhombohedron* of 105°, two opposite corners, *a* and *b*, being formed by three obtuse plane angles inclined to one another under an angle of 105°. This rhombohedron is also called the *fundamental* rhombohedron of calcite, because crystallographers have proved that all the forms exhibited by calcite may be derived from this (Fig. 60). It will easily be seen that the rhombohedron belongs to the hexagonal forms (see § 39); the line *a b*, is the *axis* of the crystal.

Fig. 61 is also very often observed in calcite; it is a more *obtuse rhombohedron* of 135° (instead of 105° as in Fig. 60). But a smart blow on the corners will produce a new, perfectly smooth face, *m n o*, corresponding in position exactly to the face, *a c b d*, of the fundamental rhombohedron. Indeed, by very little care the fundamental rhombohedron exhibited in the middle of Fig 61, will be obtained exactly equal to Fig. 60.

Form 62, the regular six-sided prism, is also quite common in calcite. A blow with a hammer will break the alternate edges, like *p q*, so that this form also splits or cleaves in such a way as to reproduce the fundamental rhombohedron represented in the middle of the prism, Fig. 62.

The most curious form commonly exhibited by calcite is the *scalenohedron*, Fig. 63 (popularly known as *dog-tooth*). This, too, can be broken by a hammer, only in three directions, corresponding to the fundamental rhombohedron, which, in our figure, is represented in the center of the scalenohedron; thus if any one of the points be broken, the fracture will be in the direction, *r, s*, parallel to one of the faces of the fundamental rhombohedron.

So also the latter, Fig. 60, will only break in *three* directions, parallel to the three faces meeting at *a*, and inclined to one another at an angle of 105°. Even if the whole crystal be crushed to dust by means of a hammer, each fragment will, under the microscope, look like Fig. 60.

Calcite thus splits in three directions only, which are determined by its crystalline form, and it is said to have *three cleavages under* 105°. From these facts we may reasonably conclude that this substance is built up of small particles having precisely the form of Fig. 60; a conclusion first elaborated by the French crystallographer, HAUY.

132. *Galena*, the principal ore of lead, exhibits a number of forms precisely like alum (see Figs. 9 to 16, § 32, 35). But whatever its *outer* form may be, it will only split or cleave according to the faces of the cube, that is, it has three cleavages at right angles to one another. The particles of this substance are therefore supposed to be minute cubes.

133. But few crystallized substances have cleavage in more than three directions, though fluor spar has four, and blende even six. Most have only two or one, or even no distinct cleavage at all; to the last class belongs quartz. It will be easily understood that the cleavage of a substance is one of its most important properties; one by means of which the body may be distinguished from others. Thus the perfect cleavage in *one* direction distinguishes gypsum and mica from most other minerals.

134. *Malleability* (yielding under the hammer without breaking) is a property peculiar to metals; gold may be beaten into leaves so thin that 8,000 put together have a thickness of only one millimeter (2,000,000 to one inch!)

Instead of the pressure produced by the sudden descent of the hammer, the pressure between two revolving rollers (Fig. 64), is very often used for working metals. In this way very thin layers are easily obtained, so as to present the greatest possible surface to the influence of solvents. Rolling the malleable metals thus answers the same purpose as pulverizing brittle mineral substances.

In the absence of proper rollers, metals, if they are easily fused, may readily be subdivided for chemical use by *granulation*. This is done by merely pouring the fused metal through a moistened broom into a basin of water, while the broom is shaken to and fro. Zinc is very often granulated in this way. Shot is made of lead by a similar process.

135. The resistance which any substance opposes to a pointed body pressed against it is called its *hardness*. This property is a most important guide in distinguishing substances, and is very often used in determining minerals. We therefore give here a simple representation of MOHS' Scale of Hardness, now universally used.

A substance readily marked by the finger nail is said to possess the hardness one, (H=1). Copper has the hardness three (H=3); glass the hardness five; a hard steel file the hardness seven, and in the ruby H=9. The last is surpassed in hardness only by the diamond, whose formula is H=10.

If, now, a mineral readily makes an impression on pure copper, but at the same time is scratched by glass, its hardness is evidently intermediate between that of copper (3) and of glass (5); it is said to be four—H=4. But if it scratches copper and is itself again scratched by copper, its hardness is equal to that of copper, or H=3. For representatives and standards of the various degrees of hardness MOHS selected the common minerals.

The following is MOHS' scale of hardness, together with a simple substitute:

Hardness.	Mineral.	Substitute.
1.	Talc	1. Finger nail makes impressions with ease.
2.	Gypsum.	
3.	Calcite	3. Copper—pure coin or sheet.
4.	Fluorite.	
5.	Apatite	5. Glass—a piece of window glass.
6.	Feldspar.	
7.	Quartz	7. File of hardened steel.
8.	Topaz.	
9.	Ruby.	
10.	Diamond.	

The very common minerals calcite (3) and quartz (7) can easily be had everywhere, and the student is advised to keep a few fragments of them as the most important members of the scale.

To determine the hardness of a mineral (or any substance) we press our nail on it while taking the mineral into our

hand. If the nail fails to make any impression whatever, the hardness of the mineral is above 2. Next take the file; suppose it makes a deep furrow when drawn across some blunt edge, the hadness is much below 7. If, next, the mineral fails to scratch glass its hardness is even below 5. If it scratches copper, its hardness is above 3. Consequently the hardness of this mineral would be about four.

In this manner the hardness is always readily determined. It is a great pity that chemists, on the whole, pay so little attention to so important a property of matter. Mineralogists have long recognized its value, and constantly use it as a most excellent aid in the determination of minerals.

[WRITTEN FOR THE AMERICAN JOURNAL OF MINING.]

THE ASSAY OF SILVER BY THE WET PROCESS.

BY PROF. H. DUSSAUCE, CHEMIST.

IV.

VOLUMETRIC ANALYSIS OF THE NORMAL SOLUTION OF SALT.

The measure by weight of the normal solution of salt has the advantage of being independent of the temperature, of having the same degree of pressure as the balance, and of requiring no correction, and except for the inconveniently long time required for weighing, we should not hesitate to prefer it. The measure by volume has not these advantages, but it is sufficiently precise and more rapidly performed, and therefore more useful, when numerous assays have to be made daily.

The normal solution of salt to be measured by volume is prepared in such a manner that it requires a volume equal to that of 100 grammes of water, or 100 cubic centimetres, to precipitate exactly one gramme of silver. If the solution can be kept at a constant temperature, no correction will be necessary, but there is need of correction when the temperature varies. These two circumstances do not alter the process, but they are important enough to require some modifications in the apparatus, and we must therefore treat them separately.

Means of measuring by using volumes instead of weights:—We take it for granted, in the first place, that the normal solution of salt has been prepared beforehand, and that it is kept at a constant temperature. We will afterwards point out the effect of a varying temperature.

A volume of solution of 100 cubic centimeters is easily obtained with a pipette gauged in such a way that, filled with water to the mark, it discharges in a continuous stream 100 grammes of water at the temperature of 15° C. (59° F.) We say in a continued stream, because some time after the stopping of the stream, two or three drops of liquid may fall from the pipette, which must not be counted.

This method of measuring, when carefully performed, is accurate for any quantity from 2 1-2 centigrammes down to a quarter of a thousandth. We will indicate now the simplest method of measuring. After immersing the beak of the pipette in the solution, apply the mouth to the upper opening, and raise the liquid above the circular mark. Place the index finger on the opening and take the pipette out of the liquid. Bring the circular mark to the level of the eye, and make the surface of the solution perfectly even with it; then remove the finger, and empty the pipette into the bottle which is receive the solution, being careful to remove it as soon as the continuous stream stops. If, after filling the pipette by suction, it is difficult to apply the finger rapidly, the opening may be closed by the tongue until the pipette is withdrawn from the solution; then put one finger on the lower opening, and afterwards apply the index finger of the other hand to the upper opening.

Temperature of the solution:—Having described the method of measuring volume, we shall now indicate the most convenient way to take the temperature. The thermometer is placed in a glass tube through which the solution is passed before reaching the pipette. The scale is engraved on the stem itself. The temperature is ascertained as soon as the liquid has reached the pipette.

Byservation of the normal solution of salt in metallic vessels:—The vessel used for this purpose is made of copper, cylindrical in form, and of a capacity of about 27 gallons. At its base is soldered a faucet, by which the solution can be drawn off into the pipette. The top, which is slightly concave, has an opening, closed by a screw stopper, traversed by a tube, which reaches nearly to the bottom of the vessel, and by which air may enter the apparatus, but not come out, thus preventing any evaporation of the liquid. This tube can be closed by a cork when the apparatus is not used. The quantity of liquid contained in the vessel is ascertained at any time by means of a wooden gauge, graduated in litres, which is dipped vertically into the liquid; but this is seldom necessary. Indeed, the water is measured more exactly by using a graduated measure in filling the cylinder. Pure as tinned copper is, altered by contact with the solution of salt and air, the solution grows weaker; This inconvenience is obviated by coating the cylinder inside with a kind of mastic used by plumbers, composed of 1-2 kilogrammes of beeswax to 1 1-2 kilogrammes of mastic. Such a coating will last a year without renewal.

Preparation of the normal solution of salt in measuring by volume:—The preparation of the normal solution of salt is made in the same manner as that to be measured in weight, and consequently we shall have very little to say on this subject.

The cylinder, we have supposed, can contain 110 kilogrammes of water; but only 105 are introduced, so as to permit it to be stirred without spilling the contents. According to the condition, that 100 cubic centimetres, or 1-10 of a litre of solution ought to contain salt enough to precipitate one gramme of pure silver, and taking 13.516 for the equivalent of the silver, and 7.335 for that of the salt, we shall find the quantity of pure salt to be dissolved in 105 litres of water; which corresponds to 105+10=1,050 grammes of silver.

Now, 13.516; 7.335; 1050; X=569.83 grammes, and as the solution of commercial salt which we have used before contains about 250 grammes per kilogramme, we find that we must take 2279.3 grammes of that solution to have 569.83 of salt.*; The mixture being thoroughly effected, wash the tube and the pipette several times with some of the solution which is poured back into the cylinder; stir anew after each washing, and then determine the title of the solution, the temperature remaining the same.

To obtain this result more easily, prepare first two decimal solutions, one of silver, the other of salt. The decimal solution of silver, as we have said before, is prepared by dissolving one gramme of pure silver in nitric acid and diluting the two so as to obtain one litre. The decimal solution of salt can be prepared by dissolving 0.543 grammes of pure salt in water so as to have one litre of solution; but it is generally obtained from the normal solution by mixing one measure of it with nine of water; it must be understood, however, that this solution is not exactly equivalent to that of the silver, and will become so only when the normal solution shall have been definitively titled. Lastly, prepare several bottles, in which dissolve one gramme of silver, with 8 or ten grammes of nitric acid. These may be called witnesses.

Now to obtain the title of the normal solution, pass a pipette into a witness bottle, stir the liquor, and after a few seconds' rest, so as to obtain it clear, pour into it two-thousandths of the decimal solution of salt, which, we will suppose, produces a precipitate. Consequently the normal liquid is too weak, which was to be expected, since the salt used was not pure; stir and again add two-thousandths, which also produce a precipitate. Continue thus by successive additions of two-thousandths, till no precipitate results. Let us suppose we have added 16-1000ths, the last two are not counted, since they have produced no precipitate; the two preceding have been partly effective, that is, the effective quantity is above 12, and below 14, or in mean, 13. Thus, in the present state of the normal solution, it requires 1013 parts to precipitate one gramme of silver, while it ought to require only 1000. We shall find the quantity of concentrated solution of salt to add, by observing that the quantity of solution of salt, first employed, viz.: 2279.3 grammes, has produced only a title of 1000—13=987-1000; and by making the following proportion:

987: 2279.3: 13: X=30.02 grammes,

we find the quantity of salt to be mixed with the normal solution to correct the title.

After washing the tubes and the pipette with the new solution, operate on a new gramme of silver. We find for example, proceeding only by one-thousandth at a time, that the first precipitates, but the second does not. The title of the solution is still too weak, between 1,000 and 1,001, that is equal to 1,000 and 1-2, but this is not near enough. Pour into the bottle two-thousandths of the decimal solution of silver, which will nearly neutralize two-thousandths of salt, and then the operation is brought back to the starting point. If, after clearing the liquid, we add half a thousandth of decimal solution, there will be a precipitate, but a second half-thousandth produces no precipitate. The title of the normal liquor will consequently be between 1,000 and 1,000 1-2, or equal to 1,000 1-4. This title can be kept, but if we wish to correct it, we observe, as before, that the two quantities of solution of salt added, 2279.3 grammes +30-02 grammes=2309.32 grammes, have produced only 999.75-1000, and that we have to add a new quantity corresponding to 1-4 of a thousandth; we then make the following proportion:

995.75: 2309.32: 0.25: X.

But as the first term is very near 1000, to obtain X, we take 0.25-1000 from 2309.32, and we get 577 grammes for the quantity of solution of salt to add to the normal solution. As it is not so easy to take so small a quantity of solution with accuracy, proceed as follows:—Weigh out 50 grammes of the solution, and dilute it with water, so that it occupies exactly half a litre, or 500 cubic centimetres. A pipette, holding 1 cubic centimetre of this solution, will give one decigramme of the original solution, and if the pipette is divided into 20 drops, each drop will represent 5 milligrammes of solution.

The above operation is not so long as it might appear, and one accustomed to those assays can obtain the normal solution with its true title in a very short time.

TO BE CONTINUED.

* The 2279.3 grammes of solution, contains 569.83 of salt, and consequently 1709.5 of water; this water must be counted in the 105 litres.

AMERICAN INSTITUTE.

Proceedings of the Polytechnic Association.

MEETING HELD AT THE ROOMS OF THE ASSOCIATION, COOPER INSTITUTE, May 6, 1869.

PROF. S. D. TILLMAN, IN THE CHAIR.

BRIDGING THE EAST RIVER.

At the request of the inventor, Mr. JAMES A. WHITNEY presented a model of a bridge, or rather a tunnel for crossing the East River. This particular form of tunnel is built of iron, in sections, the ends of the sections being closed while the bridge is being laid down. The invention did not seem to attract much attention, and did not elicit any discussion.

SANITARY PAINT.

Mr. THOMAS HODGSON described a new kind of paint which he has invented. The paint consists of silicate of soda mixed with some cheap form of carbonate of lime, such as chalk, whiting, etc. The following extracts, which are taken *verbatim et literatim*, from the circular of the inventor, will give some idea of the magniloquent claims which he advances for it:

"The sanitary paint is adapted to all the purposes to which paint is applied, and many of its preparations will resist the effects also of the decomposing and refractory powers that some of its preparations possess when submitted to a considerable degree of heat.

"It is entirely free from all offensive or poisonous exhalations which are so obnoxious in all the ordinary domestic paints. A sitting or bed room can receive several coats, if required, in one day and be occupied the same night, sweet, clean and healthy, and in the absence of the stereotyped notice, 'Beware of the Paint.'

"I disdain the use of any poisonous pigments, such as leads, litharge, oxide of copper, French green, preparations of arsenic, mercury, etc.

"The sanitary paint will give a long vocation of health to the operative painters, and work a moral revolution in the manufacture of white lead, as those that are now employed in its use or manufacture will then be free from the thousand and one diseases that have afflicted society, such as the contraction of the hands inwards, painters' cholic, paralysis of part or the whole body, premature old age, bed ridden, hopelessly and helplessly afflicted with chronic and incurable sickness, etc., etc."

Dr. EDWARDS.—This kind of paint has been used for 30 years. It will do very well for some kinds of indoor work, but will not answer for outdoor purposes.

Dr. VAN DER WEYDE spoke at length in regard to the method of preparing soluble glass or silicate of soda and potassa, and described not only its properties but the peculiarities of its manufacture.

ARTIFICIAL STONE.

Mr. HODGSON brought forward his artificial stone, which had been presented and fully described at a previous meeting. Mr. HODGSON claims in his circular that "it can be manufactured from any kind of sand, viz: such as pit sand, drift sand, river sand or sea sand, grit, quartz, gravel, shingle and stone chippings, and that it can be manufactured cheaper than any other kind of artificial stone hitherto invented or discovered." As an important ingredient in this stone is oxalic acid, some of the members doubted the possibility of producing it at such a low price as will place it within the reach of those who wish to use it for ordinary building purposes. It certainly cannot be made as cheaply as the French artificial stone or Beton of M. COIGNET, a full description of which may be found in the MANUFACTURER AND BUILDER for June of this year.

LECTURE ON LIGHT.

Dr. VAN DER WEYDE now took the stand and delivered an exceedingly interesting lecture on light and achromatism. The lecture was illustrated by an extensive series of very finely colored diagrams, and the subjects of refraction, diffraction, interference, etc., were handled with great clearness and ability; and the question of color and its practical application in the matter of paints was discussed in a very satisfactory manner. It would be impossible, however, without the aid of diagrams, to do full justice to the lecturer's efforts.

MODEL OF THE MOON.

Mr. BOYLE now addressed the audience upon the formation of the lunar craters and other peculiarities of the lunar surface. His remarks were illustrated by a very beautiful model of that portion of the moon's surface which is visible to us. This model was formed after the maps and photographs of Rutherford, Draper, De la Rue, Whipple, Mædler and others. He described very fully the method which he pursued in constructing the model, which is formed of a core of wood covered with wax. Mr. BOYLE developed a peculiar theory in regard to the cause of the irregularities in the formation of the moon's surface, and sustained them by an elaborate array of facts. It was found, however, that the paper was too long to be finished during a single evening, and the reading of the latter portion was therefore deferred to a future time. Consequently no discussion was held on the subject, and it would be unjust to Mr. BOYLE to give a report of what remains as yet an imperfect presentation of his peculiar views.

TELEGRAPH WIRES AND LIGHTNING RODS.

Dr. BOYNTON, the well known lecturer on scientific subjects, described the new telegraph wire invented by Moses G. Farmer, of Boston. This wire is formed of a core of steel, which is first carefully tinned and then covered with copper, after which the compound wire is tinned so as to prevent all possibility of rusting. This wire has been carefully tested on the telegraph line across the Sierra Nevada, and has been found to possess advantages which render it superior to any other wire now in use.

The most important features which are required in a telegraph wire are conductivity and strength. Conductivity is required so that the current may be exposed to as little resistance as possible, and mechanical strength is necessary to enable the wire to

support itself between the poles and resist the action of snow storms and ice. Copper possesses the greatest conductivity of any available metal, and steel resists a greater amount of tension per square inch than any other metal in common use. But copper does not possess sufficient mechanical strength, and steel is a poor conductor, so Mr. Farmer has united the two in a compound wire which possess the advantages peculiar to each of its components. The following extracts from the circular of the company that manufactures the new wire set these points in a very clear light:

"In comparison with the use of iron wire, the economy in construction, by employing the compound wire, comprises a saving of more than one-third the number of poles and insulators required,—which saving results from its lightness and strength, the strain upon the pole being greatly reduced; and its strength in proportion to its weight, being much greater and perfectly uniform. In addition to this, it may be strung with great facility, requiring fewer men, with less time and labor. The economy is further increased by the durability of the tinned copper, which amply protects the steel core, (also tinned); and from the fact, that the poles, at curves and angles, have less strain upon them, and necessarily stand firmer.

"As the compound wire weighs but 30 per cent. of iron wire of equal conducting capacity, a saving of seventy per cent. in transportation is effected. The same point applies to the poles and insulators. It is further evident that the escape of the electric current is diminished by the reduced number of contacts, by which the current may flow to the earth."

For lightning rods, it is proposed to take three iron wires—about No. 7 each—covered with copper and tinned in a manner similar to that just described, and twist them into a rope or strand. This gives great conducting power as well as great strength.

MR. PHIN.—That the telegraph wire just exhibited and described by Dr. Boynton, is admirably adapted to the purpose for which it is intended, no person that has given sufficient attention to the subject can doubt. We have heard the best accounts of the behaviour of this wire on the lines in which it has been employed, and indeed its good qualities are so obvious that it hardly requires any argument or testimony to prove its efficiency. The advantages of this system as applied to lightning rods, however, are not so obvious. Both iron and copper have been used with success. The British Government, under the advice of Sir William Snow Harris, uses copper strips. The French, under the advice of a special committee of the Academy of Sciences, uses iron. Either answers well enough alone, and the expediency of incurring any great expense in uniting them, is to me not so obvious.

DR. TILLMAN.—Prof. Phin has given us a long account of what has been done in France and England. We would like to have him understand that we can do something in America too.

A VOICE.—Then why do you give us extracts from French and British Journals every week in your scientific items?

MR. PHIN.—It is a matter of little consequence whether the investigations are made by Frenchmen, Englishmen or Americans—what we require is facts. Our American authorities in general prefer the form suggested by Harris.

DR. PARMELEE.—I think that if Prof. Phin will take into consideration a single point in this connection, he will at once admit the superiority of the form of lightning rod which has just been described. One great defect in lightning rods as ordinarily put up, consists in want of continuity, they being formed in pieces and joined together. In this lightning rod no joints are required. Now, the erection of lightning rods is in general confided to unskilled men, who make a business of putting up rods, and if they can get a rod which requires no joints, a great deal is gained.

MR. PHIN.—I could agree with Dr. Parmelee perfectly, if his facts were only sound. We have rods now furnished in one piece by many manufacturers.

DR. BRADLEY.—There need be no difficulty about putting up rods. Let them be in one piece, or else well connected throughout; then have them project well above the building and let them be carefully insulated from it and let them also go down to moist earth and you may defy all ordinary lightning. But if one of the real old thunderbolts should come along—I mean one of the fireballs—then look out. It will smash everything, and your rod will be of no avail.

DR. BOYNTON.—I believe in nailing the rod right to the house, and in regard to the thunder bolts orfireballs that the gentleman has described, I think it will be found that that kind never strikes a good lightning rod. It don't get a chance. The rod drains the clouds of the electricity before it has time to accumulate, and it never forms fire balls.

DR. VANDER WYDE.—Rods should not be insulated from the building. The Doctor then detailed a number of instances in which lightning rods had proved efficient, and several in which they had failed.

MR. WHITNEY.—I must confess, Mr. Chairman, that I know very little about electricity, and still less about lightning rods. It seems to me, however, that the rod under discussion is an excellent one and much superior to those generally found on our houses.

Dr. WETHERBEE detailed some instances which had come to his knowledge in which lightning rods had failed.

There now occurred a good deal of rambling discussion about the utility, etc., of lightning-rods. The hour for adjournment approached and time became precious.

Mr. PHIN.—It seems to me, Mr. Chairman, that when a gentleman brings an invention before this club his invention should receive respectful consideration or be dismissed. We have had an immense amount of general talk about lightning rods, the best mode of putting them up, their utility, etc., but with the exception of Dr. Parmelee not a single gentleman present has addressed himself to a discussion of the peculiar features of the rod introduced to our notice by Dr. Boynton. It seems to me, sir, that all this rambling discussion is entirely out of order. I would defy any man to discover the general opinion of this association in regard to this particular form of rod, for its merits have certainly not been discussed here this evening, and our time has been wasted in talk about matters concerning which there is no doubt or dispute in the minds of well-informed men. For my own part, I think well of the rod, and have no doubt that it will prove efficient. Its flexibility, which allows it to be adapted to the surfaces over which it passes and to which it is attached is a great thing in its favor. If, however, the peculiar mode of its manufacture should be such as to enhance the price very much, I think these so-called improvements would be objectionable. We want good rods, but we also require cheap rods, for we have seen rods so expensive that when put on an ordinary dwelling it became a question whether the rod was made for the house or the house for the rod.

Dr. BOYNTON.—To construct a single rod in the manner described and of the materials used by us would cost far too much to allow of its being used in ordinary practice. But by the aid of extensive machinery made for the purpose, and by the use of certain processes which are not in common use, this form of rod can be furnished at a price which is less per foot than any really effective rod in market.

Mining Summary.

GOLD AND SILVER.

Montana.

We learn from the Deer Lodge *Independent* that another rich and extensive discovery has been made in the Gold Creek region, at the head of Squaw Gulch. The pay ranges from 20 to 40 feet in depth and pays from the grass roots down. Water will be used to work this ground from the Rock Creek ditch, and they will be mined by hydraulics....Charles Hendrie, Esq., has made such arrangements with the miners of Butte City as to justify him in completing the mill which he had commenced erecting at that point some two years ago. This is very flattering for the Butte District....The miners of Bear Gulch are busily engaged at present sluicing....The last news from the Kootenai is discouraging, and many think that they are without doubt played out... We have Helena papers to April 16. From the *Post* we cull the subjoined items of mining news:—A run of five days on the ore from the Iron Rod, Silver Star district, was concluded by the Stevens & Trevitt mill, which yielded about $5,000. This was worked by five stamps alone. The Green Campbell mill is running day and night on the richest ore the mine has ever produced. Preparations are being made to erect two other mills on lodes that are being developed. The Queen City lode is opening very richly. This district has been thoroughly prospected the past winter, and the result has been that a large number of very rich ores have been sufficiently developed to hold out inducements to capitalists to invest. This is the correct manner of operating in quartz by those who own it, for it is useless to try and induce men of wealth to put a dollar in quartz unless they are satisfied that it will pay to work it. Eastern men have been too often swindled by operators in quartz to lend any large amount of credulity to speculations, theories and probabilities touching an undeveloped lead. We have no complaint to utter because rich men will not pay a large sum for an undeveloped quartz lead. It is like any other kind of property, and should be treated in a business-like manner. So long as it is undeveloped and the owner cannot convince by practical results that it will pay to put upon it a mill, just so long it is a waste of time to ask from fifty to one hundred thousand dollars for it, and feel insulted if it is refused. But the moment, by proper development, it can be demonstrated that a lode is rich and will pay to work, that moment it can be sold, for to-day there is not in Montana a rich and well-developed quartz lead begging for a purchaser.... Mr. S. T. Molitor reduced to a brick and assayed a quantity of retort, being the result of two weeks' run of the I X L mill at Unionville. The weight of the brick was 240 ounces, and its coin value four thousand and thirty-seven dollars....The first boats of the season will bring for the I X L Mining Company an entire new hoisting apparatus and pump, the depth of their shaft on the Union necessitating a larger and more powerful machine than the one now in use. During the erection of the machinery, work on the mine will have to be discontinued....All the mills in Unionvile and vicinity are running, and it is hardly necessary to state, with the usual rich results....Everything is activity in Bannack. A large force of men are engaged in sluicing out the big ditch which brings water from Horse Prairie Creek, twelve miles distant, and diffuses it all over the side hills and bars adjacent to Bannack. Claims are being fixed up, sluice-boxes put down, drain ditches made, and everything necessary to a vigorous season of mining is being performed....In German Gulch the preparations for summer operations are going on actively. Lumber is piled up all along the gulch and carpenters steadily employed making boxes. A large amount of blocks are cut, and the ring of the crosscut saw is heard on the hills every day, turning out more. Edwards & Co. have already laid a few hundred feet of flume, and the Eureka Company have near as much. The big ditch is completed, all but some fluming and the finishing of a few feet of tunnel. A number of miners expect their families up the river this spring, and are preparing their domiciles for a proper reception....A party of miners, among whom was C. C. Bodine, having prospected nearly all winter in a side gulch about four miles beyond Georgetown, succeeded on last Tuesday in obtaining a prospect that promises good diggings. They sluiced out $19 in a three hours' run with one box, after reaching bed rock. A dozen or two friends were quietly informed, and yesterday some forty miners were present, organized a district, staked off the gulch, and prepared to commence work shortly. The boys believe they have good ounce diggings. Bed rock is from 6 to 10 feet, and there is about 25 inches of water in the gulch. It has been named "Specimen Gulch," rather more euphonious than that of the one immediately below, which goes by the sobriquet of "Lop Ear."....The upper district of Grizzly Gulch yields still its thousands, and work has commenced in earnest. The water, usually scarce, only permits half a day working at present, but ere long plenty of the element will flow down the gulch, when the returns from that portion of our mines will be felt in commercial circles. More pay dirt has been taken out this last winter than during any previous time at that season, and huge piles of rich prospecting gravel are lying ready, and being hauled to the gulch from the Park (a flat or placer near the head of Wilson gulch). This part of Grizzly presents a lively appearace, from the fact that those who wintered there have lost but two days during the whole of the season in which winter is supposed to occupy, and will surely reap a rich harvest during the summer....Some forty more miners have left the Territory for White Pine. They go horseback and pack their outfit. From the *Independent* we learn that extensive preparations are going on at French Gulch. The hydraulic claim on the bar opposite the town is being put in shape. There are about seventy-five men employed in this gulch at present, and at least three hundred men can find work during the summer. There is plenty of water anticipated, and no hindrance is looked for to a long and profitable mining season. In Bear Gulch every claim is being worked, miners are washing up their dump piles; money is plenty and the prospects are very flattering....A new ditch has been completed to fully supply Antelope Gulch with water. The mines in this gulch are said to be rich....A very rich body of quartz has been struck in the Cable land, which will keep the mill busy day and night, when it once starts up. Taking everything, Deer Lodge offers some very flattering preparations for the coming season.

Colorado.

Mr. Allen, recently from Empire district, reports in the Central City *Register*, April 29, as follows:—"No mills are running there just at present, owing to the bad weather and consequent bad roads, but both the Knickerbocker and Tennessee mills have been running until within a few days, and will be started again as soon as the state of the roads will admit of hauling ore. The Disbrow Bros. are mining on the Conqueror lode—are down about 250 feet, and report a vein of pay ore five feet wide that yields under stamps $150 to $200 per cord. It is a mixture of iron and gossan, so soft that no blasting is necessary, and much of it is spaded out without the necessary of even picking. They have been crushing their rock in the Knickerbocker mill. Wm. H. Cheatley is mining on the Rup lode, and has recently struck a cross lode, or spur, which he reports as carrying a good sized vein of ore that prospects equal to $100 to $150 per cord. He intends to start up his arastras as soon as the weather will permit. Business generally, both at Lower and North Empire has been rather quiet for a few months past, but there is a prospect that it will soon be livened up again, and that a large amount of gold will be taken out this summer."....The *Register* contains the following additional items:—"The Eldorado mine on Saxon Mountain, Georgetown, is turning out ore which yields more than a dollar to the pan. It is thought by some to be a continuation of the Anglo-Saxon..... The R. M. National Bank is receiving an average of fifteen thousand per week in gold. The Cashier informs us that the number of small producers is increasing. A majority of their purchases are from this source, and we believe this to be the case with other bankers as well. Water is to be let into the consolidated ditch in about ten days. Its introduction will largely increase the yield of Bullion....John W. Remine will at once complete his twenty stamp mill on Clear Creek, the foundation of which was finished early in the spring....Dr. Garrott has bought an interest in the Miller mill at Black Hawk. It is a twenty-four stamper and one of the best in Clear Creek gulch.... The *Herald* states that Mr. C. J. Goss, of Georgetown, has struck a very rich vein of ore in the Rip Van Winkle lode, on Brown Mountain. The discovery was made at a depth of eighty-feet from the surface, and was made accidentally, while making an air shaft to ventilate the mine. The vein of rich ore is nineteen inches wide and is all solid mineral, worth between two and three hundred dollars—besides this there is eleven inches of second class ore....A. C. Johnson, of Black Hawk, has purchased the Hope company's 16 stamp mill at Gold Dirt, and has commenced tearing it down, preparatory to removing it to Missouri City. It will be erected on the line of the Consolidated Ditch, on the site now occupied by the old Cullison water mill, and will crush ore from the Golden Eagle lode, which Mr. Johnston has been working for the past year."

Idaho.

The Idaho *World* of March 15th has the annexed:—"Our attention has been called to a project, by Messrs. Charles Ostner, of Payette Valley, and L. O. Benedict of Centerville, to bring the water of the Payette, from a point near Ostmer's bridge, into this Basin, to supply the mines of Placerville, Granite Creek, Centerville, Pioneer City, and the adjacent districts. The plan proposed is to force the water by five stationary engines, from the river, into as many ditches in tiers, to the summit of the mountain which divides this Basin from Payette Valley, and thence lead the volume by ditches to the respectively mentioned camps. The projectors estimate the total volume of water which can be thus forced to the summit at fully 10,000 inches, and the total cost of engines, fluming and ditching will not exceed, they think, $300,000. [The *World* characterizes the project as utterly and hopelessly impracticable.]....We regret to learn that there is some trouble in Centreville between the miners whose claims are supplied with water from the Goldtrap ditch, and Mr. Goldtrap's agent in charge of the ditch, as to the price of water. The price demanded is 50 cents per inch day and night, and the miners say they will give no more than 30 cents. Mr. Goldtrap left last fall for a visit to his old home in Ohio, and is daily expected back. As his agent has no discretion in the matter at issue, nothing can be done to compose the trouble until he returns. Meantime the claims will have to lie idle, and every day now is worth three days late in the season, in mining. ....On Tuesday the second clean up of this season was made at what is known as the Sam Thompson claim of the large mining and ditch company of Noble, Saunders, Wood & Elkins, over on the hill near Slaughter-house Gulch, and the product was about $6,000, coin value. The total gold product of the Company this season has been over $12,000. On last Sunday they paid off their hands in full to date, an aggregate of above $6,000.....The large claim of the Brainard Company, on Granite creek, has been sold to a Chinese Company for $35,000. The ground has always paid very richly.....The La Grande *Sentinel* says gratifying clean-ups have already been made by the miners on Grande Ronde river. Chinamen have lately bought claims and commenced working them.

Alaska.

The San Francisco *Herald*, March 25, has the following account of great discoveries of gold in Alaska:—"The schoonor Ann Eliza, belonging to Jansen & Co., arrived here on Tuesday last, laden with seal skins from Kodiak Island and the lower coast of Alaska, brings intelligence of immense discoveries of gold in placers on the main land, latitude 61 north, longitude 150 west from Greenwich. The steward of the vessel exhibits some fine specimens of dust, which he says was obtained in the proportion of one teaspoonful to three shovels of dirt, taken from six feet below the surface. He also has specimens of quartz and nugget gold. The captain and crew of the vessel confirm his statements. The discovery was made 120 miles from Kodiak Island, upon the Kuyak River, which debouches into Cook River, by a Russian engineer who was prospecting. He was led to the effort by the appearance of specimens which he obtained from the Indians. The second mines discovered are about sixty miles from Sitka, between Mount Fairweather and Chilicut River. The third discovery is upon one of the islands, the name of which was not known. In the Kuyak River mines the gold is found along the river banks, and in the gulches of the Chigmit Mountains. The Kuyak River is navigable, for light draught vessels, for thirty-five miles above its junction with Cook River. On account of the climate the mines can only be worked for five months of the year. At the time the Ann Eliza left, rumors of silver discoveries were common, but doubts were entertained of its existence; gold, however, was plenty. The steward and his companions lost their mining tools by the capsizing of their skin boats while crossing the Kodiak. After procuring a proper outfit they will return thither. Of course these new discoveries will attract only ordinary attention on account of their remote location from civilization, and occurring at the height of the White Pine excitement; but under ordinary circumstances a grand rush would set in that direction."

Arizona.

The California *Guardian* of March 20th contains a letter from Fort Mojave, from which we make the following extract: "Some faint idea may be formed of the vastness of the deposits of the precious metals in Arizona, when I mention only those ranges of mountains which have been prospected to an exceedingly limited extent, and in which ledges have been found assaying all the way from $30 to $3,000 per ton; and yet, aside from the Vulture Mine in the Wickenburg district, none have been worked beyond the sinking of a shaft of sufficient depth to prove the existence of metal, but more particularly for the purpose of holding possession. No country in the world presents finer opportunity for full labor than does Arizona. Labor can be continued without interruption throughout the entire year. The following are some of the mountain ranges upon which hundreds of claims have been taken: Low range between the Gila and Colorado

rivers, bearing gold; Castle Dome mountains, argentiferous galena; Chimney Peak, gold: Plumosa range, twelve miles east of and parallel with the La Paz mountains, gold, lead, and copper; Williams' Fork mountains, gold, copper, lead; Haquehela, twenty-five miles east of Plumosa, gold, copper and silver; Hequevar, twelve miles north of Hassyampa, gold; Wickenburg, Vulture Mine, twenty-four miles east of Haquehela, gold; Weaver mountains, on head waters of Hassyampa, gold; Bradshaw mountains, east of Weaver, gold and copper; Prescott mountains, north of Weaver and Bradshaw, gold, silver and copper. Of the mountains north and east of Prescott and the Tonto Basin, little is known.

Japan.

The editor of the Nevada *Enterprise* has been shown a letter from Yokohama, Japan, from which the following extracts are taken:—"I am convinced that these islands contain as rich gold and silver mines as any in the world. The heretofore exclusive policy of the government has prevented the proper development of the mines—besides, the people until now entertained the opinion that it was criminal to extract more ore than was required for immediate and necessary use, and that a great sin would be committed in case no ore was left for future generations. Oh, for a dozen or so Washoe prospectors! Yet there are some Japanese, not having the fear of their gods before them, who have smuggled to this place enough gold and silver to fill 13 large warehouses. Different and more liberal ideas are now prevailing with the party at present in power. The rebellion between the northern and southern parties still continues. The party now in power is entitled to the ownership of the mines, and being in need of money to carry on the war, has for the first time invited foreign miners to act as superintendents, on large salaries, in order to extract as much bullion as possible in a short space of time."

Utah.

The Salt Lake *Reporter*, March 3d, says:—"We have been shown by a gentleman an assay of ore from a mine within 40 miles of Salt Lake City, which has heretofore been worked merely for lead and silver. The assay was made at the office of Rein, Hennire & Co., San Francisco, with the following results: 18.20 oz. of silver, at $1.30 per oz., $23,69; 48.60 oz. of gold at $20.67 per oz., $1,004.51. 66.82 0z. per ton of 2,000 pounds, rating at $1,026.25."

British Columbia.

The Victoria *Colonist*, March 16, reports the starting of a party of prospectors to further test the rich veins of gold-bearing quartz said to exist at Gold Harbor, Queen Charlotte Island:—"As far back as 1858 the Hudson Bay Company knew of the existence of rich veins of gold-bearing quartz there. Specimens of the rock were brought to Victoria by the late Capt. Reid, then in command of one of the H. B. Co.'s ships, and subsequently three of the company's servants started for the harbor and located there. Powerful and hostile tribes of savages inhabited Queen Charlotte Island at the time, and the three men were seized and held in slavery until ransomed with blankets by the company. Three or four expeditions were subsequently made to the spot, and in 1863 the writer was shown four pieces of beautiful milk-white quartz, through which ran delicate threads of gold. A limited joint-stock company was organized to work the vein; but in the general disaster that overtook our mining corporations in 1864, the company went under and has not since reappeared. The once hostile tribes have been reduced to a mere handful and are no longer feared. The expedition which started on Sunday is composed of experienced prospectors and quartz miners, and we expect to receive a good account from them soon."

IRON.

Michigan.

The following statistics are taken from the Houghton, Mich., *Mining Gazette*.

Reference was made to them in our editorial columns last week, but unfortunately they were prevented from appearing with our comments from want of space.

PRODUCT OF THE IRON MINES IN 1868.

AMOUNT OF ORE MINED.

	Gross tons.
Jackson Iron Company	129,261
Lake Superior Iron Company	105,962
Cleveland Iron Company	101,669
New York Iron Company	45,750
Washington Iron Company	31,962
Pittsburg and Lake Angeline Company	24,000
Edwards Mine	17,028
Barnum Mine (Iron Cliff)	14,000
Marquette Iron Company	8,951
New England Mine	7,190
Champion Mine	6,517
Iron Mountain and Foster (estimated)	1,000
Total	493,290
Product of 1867	469,320
Increase	23,970

PIG IRON PRODUCT.

	Gross tons.
Bancroft Furnace	3,700
Collins Furnace	5,150
Morgan Furnace	4,150
Pioneer Furnace (two stacks)	9,500
Michigan Furnace	4,452
Greenwood Furnace	1,437
Champion Furnace	4,200
Fayette Furnace	2,500
Deer Lake Furnace	600
Schoolcraft Furnace	1,736
Northern	
Total	30,425
Product of 1867	30,911
Increase	5,514

TOTAL AMOUNT AND VALUE OF IRON PRODUCED.

Year.	Tons, iron ore.	Tons, pig iron.	Value.
1858	31,035	1,629	$249,202
1859	65,679	7,258	575,529
1860	116,998	5,660	736,496
1861*	45,430	7,970	419,401
1862	115,721	8,590	984,977
1863	185,259	9,813	1,416,935
1864	235,123	13,832	1,867,215
1865†	195,256	12,283	1,590,430
1866	296,872	18.437	2,405,960
1867	460,320	30,911	3,475,720
1868	493,290	36,425	3,676,705

* Beginning of the war.
† End of the war.

COPPER.

Alaska.

The *Oregonian*, of the 27th ult., contains the following paragraph: "We yesterday saw a boulder of the metal brought down from Sitka by Captain Langdon, of the steamer Geo. S. Wright. It is heavy and has almost the appearance of genuine gold, though an expert would not mistake it. There was among those who saw it a diversity of opinion as to what it really was, some believing it to be really copper, while others thought it might be a compound containing gold, silver and copper, or silver and copper alone. Accordingly, the nugget was yesterday taken to Charles F. Keuhn, jeweller, for test. Upon applying the acid test, copper was found to be in large proportion. No silver test had been applied when we visited Mr. Keuhn's place, but he thinks there may be a small per cent. of silver in the metal. It is soft as pure copper, and the nugget may be readily sawn or cut. The specimen was brought to Sitka by the Indians, who say they procured it on what is called Copper Creek, and that it came from a burning mountain in a fused state. It seems to have been once fused and to have been run into a crevice in the rocks. Whether or not it contains any metal more precious than copper, the locality from which it was taken must be immensely rich, if the stories of the Indians be true. The Editor of the San Francisco *Mining Press* comments as follows on this intelligence:

"Of course the idea that this 'boulder' was thrown out of a burning mountain, in a fused state, is all moonshine. Volcanoes never throw out metals of any kind, at least not in any appreciable quantity. It is more than probable that it may contain very little silver, as native copper does; and there is no improbability in the supposition that valuable copper mines may exist at or near the locality where this boulder was found."

California.

From the Mariposa *Mail*, April 16th, we learn, the mine known as the Buchanan Copper Mine, is now owned and worked by Vilas & Co., and is yielding richer ore than ever. The Company has between 80 and 100 men employed. The ore, a portion of which is reduced to "matte," has, during the winter, accumulated to thousands of tons.

COAL.

Nova Scotia.

THE FIRE IN THE COAL MINES.

The *Eastern Chronicle*, April 3, says:—"We regret to learn that the fire in the Foord Pit, Albion Mines, is likely to prove a more serious affair than was one time anticipated. On Wednesday evening last, several explosions occurred, since which time we have not learned any further particulars."

Pennsylvania.

The *Luzerne Union*, (Wilkesbarre, Pa.,) May 12, says:—"There does not seem any longer a reasonable doubt but they have found a vein of coal in Union township, as they are going to sink a shaft to it immediately, at least such is the report. The excitement is very great back of the mountain, the people thinking they have as good a coal field as there is in the valley. Speculators are buying land around the shaft at a large advance."

Virginia.

We learn from one of our exchanges, that Dr. S. B. Morrison has discovered, some four miles from Goshen, in Augusta, a valuable deposit of anthracite coal, while blasting a channel for a mineral spring.

QUICKSILVER.

Peru.

A correspondent, writing from Lima, April 14, notes the following statements respecting the quicksilver mine of Huancavelica. He says: "The bad state of the mine and the almost insuperable obstacles offered by the mountain roads prevented it being profitably worked during late years, and an engineer sent especially from California by the Almaden company to make a report on the mine declared that were it nearer the coast and good communication established there would be no doubt of its becoming a very dangerous rival to the mine worked by his company. The property belongs to the Peruvian government, and the Minister of the Treasury has just published an offer to lease it to any responsible company or individual for 100 years, at a rent of $5,000 per annum for the first ten years, increasing afterwards; the party contracting to give bonds for the prosecution of the work, and incurring a fine of $200,000 if he should injure the mine by false excavations. The matter is well worthy of the attention of capitalists in the United States, and now, as the country appears to have entered into a period of peace and tranquility, no danger of damage or injury from instestine convulsions may be immediately apprehended."... Touching the yellow fever epidemic, the correspondent writes:—"The yellow fever has not yet assumed any very dangerous form in the capital or in Callao, but the reports from the southern coast continue to be truly distressing. The beautiful city of Tacna, forty miles in the interior from Arica, after having escaped the earthquake that completely demolished the latter town, is the scene of the ravages of this terrible visitor. Of a population of 10,000, scarcely 1,500 stay in the town, the greater part having fled to the interior for safety, and before the exodus took place at least 3,000 fell victims to the epidemic. Of the few still residing in Tacna nearly forty die every day, and the consternation and terror is so great that no provisions, assistance or nurses can be procured for the sick. Bodies are thrown into trenches without coffins or shrouds, and despite the indefatigable efforts of the physicians sent from here by the government it has been found impossible to make headway against the enemy. From other portions of the south we also hear reports of the same character. The great number of refugees from those sections now in Lima are subjected to the strictest quarantine, and are constantly being visited by the medical men appointed for the purpose of examining their condition and enforcing the necessary sanitary precautions."... About the railway now being built in the republic he says "I have nothing but the most favorable reports to communicate. It is more than probable that the important line from Lima to the head waters of the Peruvian tributaries of the Amazon will be shortly carried out. The Arequipa road is progressing with rapidity; and Mr. Meiggs, after his return from Chile, proposes making tenders for some of the northern roads, that especially connecting the port of San Jose with the rich copper and agricultural district of Cajamarca. From Lima to Pisco—the wine and *aguardiente* producing section of Peru—a road is about to be constructed, and the line from Lima to Huacho is now being actively pushed. A large number of Americans are employed on this road—among them Mr. Gustavus Ames, well known in engineering circles in the United States."

Nova Scotia.

The Halifax Correspondent of the Canadian *Monetary Times*, under date April 27, thus reviews mining affairs:—

"The past fortnight was so wet and unsettled that little progress has been made in surface explorations. The snow in the woods is still several feet deep, and is later disappearing than in previous years. There is an absence of all excitement, and all claims now taken up have been acquired for bona fide working. With the exception of Uniacke, reports are meagre, but decidedly encouraging.....In Wine Harbor District, the prospects of Globe Company continue good. Work on the Napier Mine is progressing satisfactorily. A new gold streak has been discovered on the Provincial Company's property. The best crushing from the Eureka mine produced a little over one ounce to the ton, the yield being 18 ozs. 18 dwts. 11 grs. Report from the Eldorado Co. not received.....The Dominion Company's Mill, in Sherbrook, is now working night and day. The shaft has been emptied of water, and no further stoppages are anticipated. The Wellington will send up about 300 ozs. as this month's product. Other companies not heard from.....The Strawberry Hill mine, in Tangier, has sent 127 ozs. to town; the result of March crushings. The Nova Scotia, a mine favorably noticed by Prof. Silliman, some years ago, after lying fallow since 1864, is to be worked again under Canadian auspices. The return from the district augurs well for the success of further enterprise.....The reports from Oldham district are very encouraging. Several old shafts are being baled with a view of resuming work, and the mill returns still show a steady high yield.....Several prospectors have begun work in Ophir. The Ophir Co. are still fortunate and intend to keep up the reputation of the district.....Some very good crushing is reported from Oniacke. The Central Co. obtained over two ounces per ton from last parcel of quartz. Five tons from the Union Co's. shaft, gave twenty ounces, hard amalgam, which had not been reported when our informant left, but was estimated to yield, at least twelve ounces of gold. The Uniacke Co. expect 120 ozs. to their month's credit. The Montreal Co. have been exploring and discovered a belt of quartz and slate sixteen feet wide, which can be mined for less than a dollar. Any returns over three dollars will be a profit. The Queen Co., discouraged at the falling off of returns, let a shaft on tribute, and on Saturday, the 24th, just before leaving off for the day, a last shot brought out a piece of quartz, weighing twenty-six ounces, twelve ounces of which were pure gold, this was at seven feet from the surface. Tenders are out for sinking on the Toronto Company's shaft....At Musquodoboit, Mr. Hyde has now one hundred men at work, including all who are at the mine and engaged on the tramway, which he is having built. The results from his mill have not transpired. Mr. Burkner brought up about 50 ounces as the first yield from his mill, and the lode which he is working has widened out to five and a half feet, and still shows much shotty gold on the face. The average yield from last crushing of two and a half feet of vein stuff was fifteen pennyweights per ton."

Metallurgical Industry in Prussia.

The *North German Correspondent* says:—"In the year 1867, the number of iron-smelting works was 1,211, employing 87,086 workers, and the entire value of the products was 115,678,648 thlrs. These industrial establishments produced: unwrought iron to the value of 19,789,481 thlrs., raw steel-iron 2,022,200 thlrs., cast-iron 12,934,914 thlrs., bar and rolled iron 28,267,858 thlrs., sheet-iron 5,810,333 thlrs., iron wire 2,588,342 thlrs., and steel 19,351574 thlrs. The steel industry has made enormous progress in the last few years, and Prussia in this branch is now unsurpassed. The celebrated establishment of Krupp in Essen has a world-wide reputation, and seems to have brought the manufacture of steel to the highest attainable perfection. With regard to the remaining metallic products of Prussia, the respective values of the quantities obtained in the same year were the following:—Silver 2,756,455 thlrs., lead 4,739,812 thlrs., copper 3,739,440 thlrs., brass 1,269,339 thlrs., zinc in bars or plates 7,982,491 thlrs., sheet-zinc 2,630,317 thlrs."

Geology.

The following extract is from an interesting "Catechism of Scientific and useful knowledge:"

Q. What description of stone has been most sought after? A. The Philosopher's stone.
Q. Has it ever been found? A. Very frequently.
Q. Where? A. In a horn.
Q. Where deposited? A. In a hat.
Q. From what does it proceed? A. Quartz.
Q. What is a petrifaction? A. "Rather a hard party."
Q. Where does granite lie? A. In beds.
Q. What is a stratum? A. A layer of anything.
Q. Will you mention one? A. Yes; a hen.
Q. Mention another. A. A ship: she "lays-to."
Q. What is a flint? A. A miser's heart.
Q. Can you break it? A. Yes, certainly.
Q. Will you describe *how*? A. Open his chest.

—We understand that Mr. Heatheringtom, of Halifax, has decided to resume the publication of his *Mining Gazette*.

—The fibrous mineral, asbestos, has often been spoken of as a substitute for rags, but as the supply of asbestos was uncertain, no practical use has been made of the knowledge. The Montreal *Herald* believes there are several deposits of asbestos in Canada, particularly in the eastern townships, and these will, no doubt receive attention as the demand for their mineral increases. A mine of asbestos, which has a long fibre, and quite equal to the Italian, exists on the property of the Slate Company at Melbourne, and is being worked by parties in New York.

—A bed of salt has been discovered at Dax, in France, which is reported to extend over a space more than a mile in diameter, and is 100 feet thick. It lies at a small depth, and is of great purity.

MARKET REVIEW.

FRIDAY EVENING, May 14, 1869.

Mining Stocks.—The amount of business done at the Mining Board yesterday was limited. Some 2,000 shares of Montana are reported to have changed hands at 19@19¼c.; 100 Quartz Hill, s 3, at $1 35; 300 Smith and Parmelee, at $3 20@3 25. To-day the business done was small. Smith and Parmelee went off at $2 20 @ $2 25, closing at the former figure. 200 shares of Grass Valley sold at 55 cents. In Petroleum Stocks, Home brought $9 50 and Central 70c The following are the prices quoted at the board:

GOLD STOCKS.

	Bid.	Asked.		Bid	Asked.
Consolidated Gregory	2 90	3 00	Montana Gold	17	
Grass Valley	40	55	Quartz Hill	1 30	1 45
La Crosse Gold	15	20	Smith & Parmlee Gold	3 20	3 25
Mariposa	22½	25	N. Y. & Eldorado	40	
Mariposa preferred	48½	49½	Gunnell Gold	30	50
Rocky Mountain Gold			Benton Gold	35	42

SILVER STOCKS.

Combination Silver		10 00	Quicksilver	19	19½
Owyhee Mining		....	Atlantic and Pacific		
Midas Silver			Manhattan Silver		80 00

COPPER STOCKS.

Central			Davidson		30
Calumet			Hilton		....

LEAD STOCKS.

Walkill	21	29	Walkill assented		40

COAL STOCKS.

Cumberland	30½	33	Am. C. Co., bet. call		
Spring M. Coal, bet. call			Lehigh & Susquehanna Coal		....

PETROLEUM STOCKS.

	Bid.	Asked.		Bid.	Asked.
Bennehoff Run	..		Rynd Farm	17	19
Brevoort	1 25	1 50	United Pet. Farms	29	35
Buchanan Farm	55		Union	....	....
Central	70	75	United States	1 60	1 20
Clinton Oil	2 15	....	Sherman & Barnsdale	..	..
National	....	....	Second National	..	..
N. Y. and Alleghany	..	....	Bliven	..	..
Pithole Creek	1 75	2 00	Rathbone	..	..
Home Petroleum	9 50	9 80	Northern Light	..	..
Pacific Oil	..	....	Bergen Coal and Oil	..	..

Government Bonds.—Prices show a considerable advance since our last and are thus quoted to-day:

U. S. 6s, 1881, coupon	120½@121	U S 5-20s, '65, new coup.	118½ 118½
U. S. 5-20s, 1862, coupon	120 120½	U. S. 5-20s, 1867, coupon.	118½ 118½
U. S. 5-20s, 1864, coupon	116½ 116½	U. S. 5-20s. 1868, coupon.	118½ 118½
U. S. 5-20s, 1865, coupon	118½ 118½	U. S. 10-40s, ex. coupon	107½ 108
Six p. c. Pacific R. Bds	106½ 106½		

Foreign Exchange.—Foreign exchange is steady. The demand is moderate and the supply of bills quite light. We quote:

Lon. (pr. bks), 60 dys	109½@109¾	Swiss	5.18¾ 5.16¾
Lon. (pr. bks'), sight	110¼ 110½	Hamburg	35¾ 35¾
London, prime com. 60 d	108¼ 109	Amsterdam (bankers')	40¼ 40¼
Paris (bankers'), long	5.16¼ 5.16¼	Frankfort (bankers')	40¼ 40¼
Paris (bankers'), short	5.13¾ 5.13¾	Bremen (bankers')	78¾ 78¾
Antwerp	5 18¾ 5.15¾	Berlin (bankers')	71 71½

Gold.—Gold has been strong during the morning at 138¼@138¾, an advance of ¼ to ⅜ on the average prices of yesterday. There appears to be no special consideration affecting the premium, beyond a reaction in the price of bonds at London. Loans have ranged at 4 to 6 per cent.

Some moderate amounts of Mexican gold and California Bars are expected to be sent to Europe by to-morrow's steamers.

Money gains in ease, and call loans may be quoted at 6 to 7 per cent. on Governments. Discounts are done, outside the banks, generally at 7 to 8 per cent.

Petroleum—Refined—the market is ruling weak for forward delivery, but there are a number of lots being taken at the concessions; for parcels on the spot prices are not so strong at the close, with 32c. quoted. The sales are 2,500 bbls. standard white, on the spot, at 32@32¼c., mostly at the latter price; 3,000 bbls. do., from May 25th to June 10th, at 32¼c.; 1,500 bbls., sellers' option first 20 days in June, at 32½c.; 1,500 bbls for last half May, at 32½c.; 4,200 bbls. for first half June, at 32½c.; 2,000 bbls. for last half June, at 32¼c.; 1,500 bbls. for July, at 33c., and 3,000 bbls. for July and August at 33c. Crude, in bulk, is rather pressed for sale; a small lot is reported at 16c. and the general prices are 16@16½c. Crude, in shipping order, is held at 22c. For Philadelphia delivery the business is quite limited; there is not much offering for immediate delivery except at old prices; the sales are 1,000 bbls. standard white, for May delivery, at 32½c., and 1,000 bbls. do. for August, at 33¼c.

Receipts for the week	pkns.	11,891
Exports for the week	galls.	1,445,652
Exports from Jan 1st	do.	18,477,335
Exports same time last year	galls.	14,325,589

The following is the quantity exported from other ports, Jan. 1 to May 1.

		1869.	1869.
From Boston	galls.	1,013,105	872,544
Philadelphia		6,510,591	9,057,891
Baltimore		469,149	652,517
Portland		....	19,072
New Bedford		....	....
Cleveland		....	....
Total		7,992,845	10,601,504
Total exports from the United States		26,530,537	25,147,354
Same time in 1867			18,467,892
Same time in 1866			16,776,436

Copper is dull and without many transactions. Sales have amounted to 200,000 pounds during the week, in lots, at 23½c. for Baltimore, and 27c. for Lake.

The London market declined to £71 for Chili.

Tin is steady, with a jobbing business, at 32@32½ for Straits; 35 for Banca, and 31 for English, all gold; 1,000 slabs Straits, to arrive at Boston, were sold at 32c.

The London market is quoted at £133 for Straits. Amsterdam declined to 79½ florins.

Spelter—Dull at $6 25, gold, for Silesian.

Lead is steady at $6 25@$6 35 for Ordinary Foreign.

Lime—The market for Rockland continues firm, at $1 25 for Common and $1 75 for Lump.

Saltpetre—Sales have been made in Boston of 541 bags Crude, equal to 10½ cents currency.

Cement—The market for Rosendale continues steady at $2, cash.

Zinc—We quote Dry American at 7½@8c.; Dry French, 11½@11¾; Sheet (Metal) 12@12½c.

The duty on sheet is 2½c. per lb.

THE IRON TRADE.

NEW YORK, May 14, 1869.

There is no change of prices to report. Trade is as flat as can be. The strike in the coal fields might send manufactured iron up if there was any demand, but no such rise is anticipated at present. In Scotch Pig the sales are 100 tons Eglinton, ex. ship. 100 do. No 1 Mineral Vale, and 1,000 do. Glenden Forge, on private terms. English Rails continue in request, and we notice sales of 300 tons at $56, gold; there is a moderate inquiry for American at $75@$77, currency. Bar from store contiues quiet, and nominally steady at our quotations.

Import, from Jan. 1 to April 30, 1869.

	Bar.	Pig.	Sheet.
From Foreign Ports	tons, 5,934	tons, 15,323	bdls., 117,434
Coastwise ports	50	....	3,337
Total	tons, 5,981	tons, 15,323	bdls., 120,771
Same time 1868	3,097	6,101	59,024

Lehigh Valley Iron Trade.

Pig Iron transported by the Lehigh Valley Railroad Co. for the week ending May 8, 1869:

From	Tons.	Total.
Carbon Iron do	120	
Lehigh Valley Iron Co	270	
Thomas Iron do	656	
Lehigh Crane Iron do	810	
Allentown Iron do	475	
Robert Iron do	370	
Glendon Iron do	235	
Bethl'm Iron Co	60	
Other Shippers	640	
Total	3,640	

Market Prices.

NEW YORK, May 14, 1869.

DUTY.—Bars, 1 to 1½c. per lb.; railroad, 60c. per 100 lbs.; boiler and plate: 1½c. per lb.; sheet, band, hoop and scroll, 1¾ to 1¾c. per lb.; pig, $9 per ton, polished sheet, 3c. per lb. Payable in gold.

DUTY ON STEEL.—Bars and Ingots, valued at 7 cents per lb. or under, 2½ cents; over 7 cents and not above 11, 3 cents per lb.; over 11 cents, 2½ cents per lb. and 10 per cent. ad val. (Store prices.)

Am. pig, fy. No 1, best,	$40 00@42 00	STORE PRICES—Less 5 per cent.	
" " 2x frdy,	38 00 40 0	Bar, Swedes, ord'y sizes	— — 140 00
" Grey Forge	35 00 37 00	Bar, Eng. and Am., rf'd.	92 50
White and Mottled	32 00 34 00	Bar, Eng. & Am., com.	85 00 87 50
Pure white for Cal. mar.	32 50 — —	Scroll	120 00 150 00
Scotch Pig, No. I, best bd	40 00 44 00	Ovals and half round	117 50 142 50
" " " outside,	40 00 — —	Band	117 50 — —
Wt. No. 1 Scrap f'm yd.	47 50 50 00	Horse Shoe	117 50 — —
Ex ship	45 00	Rods, ¼@3-16 inch	97 50 155 00
Bar, Ref., En. & Am.	85 00 90 00	Hoop	125 00 150 00
Bar, Sw's, as. sizes, gold	82 50 87 50	Nail Rod, per lb	8¼ 9¼
Old Rails	47 50	Sheet, Rus. as'd. Nos. (gold)	11¼ 18
R.R. Iron, For., fin Stock gold	54 50 55 50	Sheet, s'gle. D & T. com	5½ 6½
R. R. Iron For., to imp.	55 00 00 00	Rails, Eng., gold, ton.	55 00
" " Amer. at wks. currency	75 00 76 —	Rails, American at w'ks	76 00
R. R. Iron, Am., deliv'd	78 00 80 00	STEEL.	
Stt rails of any pattern at works, currency	....	English, cast 2d & 1st qual.	18 @22
Solid Steel rls. For., gd.	95 — —	Eng. Spring 2d & 1st qual	9 11¼
Street Rails at works	85 00 — —	Eng. Blister 2d & 1st qual.	11¼ 19
Light rls. for mines &c. at works	$85 00@— —	English Machinery	12½ 15
Do. delivered here	.... — —	Eng German 2d & 3d qual.	14 16
		Am. Blister, "Black Diam'd,"	10¼ 16
		American, Cast, Tool "	19 —
		American, Spring "	10 13
		American Machinery "	— 13
		American German "	10 13

THE COAL TRADE.

NEW YORK, May 14, 1869.

The demand for coal during the past week, at somewhat fancy prices, has been fair, but the trade limited in consequence of dealers being unable to fill orders. This results from the fact that the strike in the Schuylkill and Lehigh regions has reduced the shipments for the week about one half. Rumors of all kinds have been floating about Trinity Building, and thus the market was kept excited from day to day. There are no prices for coal at the present writing, or at least the price quotad to-day would not hold good for to-morrow. One leading Lehigh shipper informs us that there is not a pound of Lehigh coal in this market, and that he had been offered $8 for a cargo of lump size. There is a small stock of miscellaneous coals afloat, but an advance of a dollar per ton is asked for it—say from $6 to $7 per ton.

A later telegram to-day informs us that the entire Lackawanna, Scranton and Pittston Districts had stopped work, excepting only the men employed by the D. L. & W. Railroad Co. and the Pennsylvania Coal Co., and that they were to hold meetings this evening, and would in all probability join their comrades. Now then, how high the price of coal will reach depends, of course, entirely upon the length of time the men will be enabled to hold out. It is many years since the entire regions were out at one and the same time. As each section will now have to take care of itself, and will not receive aid from another that may be at work—which has been the case heretofore during strikes—the time of its continuance depends entirely upon the amount of money the miners may each have individually on hand to contribute to a common support, or the amount of credit given them at the stores. If the suspension continues three or four weeks, the surplus produced thus far this year over that of last will have been consumed, and the market left ready for immediate operations. Up to the end of the strike of course it must be expected that, with a constant reduction of he amount of marketable coal, that prices will be speculative. On the supposition that the miners continue the suspension until a deficiency is created, it is hard to say what will be the state of affairs. Our advice to those who are actually in want of coal, and cannot hold out until the end of the strike, is to *buy immediately at current rates.* If you have sufficient on hand to last six weeks, *keep out of the market* and save your money, for while the suspension will cause coal to advance, it will recede to its former price as soon as operations are again resumed.

Freights remain unchanged.

The following will show the exports of coal from the port of New York for the week ending May 4th, and for the season to that date, also the amount exported last year for the same period.

Exports for the week	tons	3,150
Do. from January 1	do	29,018
Do. same time last year		17,370

PHILADELPHIA, May 13, 1869.

The market is unsettled. There is no demand for coal, and very little stock on hand. There was about 50,000 tons at Port Richmond on Monday. The Wilkesbarre and Pittston men have struck, and part of Scranton.

The following table exhibits the amount of Coal that was passed over the various routes of transportation from the Pennsylvania Coal districts for the week ending May 4, 1869, and for the season to that date. A comparison is also made with the amount transported the corresponding week in 1868, showing the increase or decrease, as the case may be:

	1868.		1869.		INC. OR DEC.	
COMPANIES.	WEEK.	TOTAL.	WEEK.	TOTAL.	WEEK.	YEAR.
Phil. & Read. R. R.	60,154	1,061,942	80,136	1,219,389	29,982	157,397
Schuylkill Canal	38,797	184,207	13,857	163,857 d	14,940 d	20,350
Lehigh Valley R. R	48,185	884,865	65,141	1,045,967	16,956	161,101
Lehigh & Sus. R. R	19,754	173,016	40,468	300,709	20,717	127,693
Lehigh Canal	27,452	104,687	29,012	154,845	1,470	50,158
Scranton North	10,089	185,742	9,214	181,890 d	875	46,148
Scranton South	24,071	381,705	34,207	539,787	10,136	258,982
Penn. Coal Co. rail.	20,763	241,711	19,052	278,666 d	1,711	36,955
Penn. Coal Co. can.	1,062	3,519	720	2,375 d	342 d	1,144
*Del. & Hud'n Rail.	....	....	6,480	93,632	....	93,632
Del. & Hud. Canal	52,700	224,963	48,345	237,072 d	4,355	12,109
Shamokin	12,037	133,768	9,576	129,554 d	2,461 d	4,209
Trevorton	420	6,310	....	7,054 d	420	744
Short Mountain	2,623	25,006	2,332	26,613	309	1,607
Lykens Valley Co.	1,955	25,759	1,173	16,832 d	782 d	8,920
Hunt'g'n & B'd T'p	5,777	71,403	6,389	107,468	562	36,065
Wyoming South	....	....	....	12,799	....	
*Wyoming North	....	....	....	....	....	
Williamstown Col.	3,263	52,018	5,737	62,322	2,474	10,304
Total	328,999	3,710,610	391,289	4,580,831		
1868			328,999	3,710,610		
			62,290	870,221		

*Closed.

Lehigh and Susquehanna Railroad.

Report of Coal shipped for week ending May 8, 1869.

Total Mauch Chunk Region	4,149 02	66,298 06
" Hazleton	9,246 07	47,399 12
" Upper Lehigh	23,305 07	55,999 00
" Wyoming	23,767 06	231,012 10
Grand Total	40,468 02	400,708 08
Corresponding week last year	19,751 00	173,016 05
Increase	20,717 02	227,693 03
Decrease	....	....
Forwarded South from Mauch Chunk by Rail	22,553 19	286,652 07
Delivered on line of L. & S. R. R. ab've M'ch Ch'k.	959 11	14,152 18
Delivered to Lackawanna & Bloomington Railroad at Plymouth Bridge	1,913 08	12,081 03
Delivered to L. V. R. R. Co. at Sugar Notch		5,100 03
Delivered at Coal Port for shipment by canal	14,750 04	82,592 17
Total	40,468 02	400,709 08

Schuylkill Coal Trade.

BY RAILROAD AND CANAL, FOR WEEK ENDING, MAY 14.

	RAILROAD.	CANAL
St. Clair	12,910	
Port Carbon	3,115	6,982
Pottsville	1,636	495
Schuylkill Haven	11,523	8,727
Auburn	1,225	....
Port Clinton	4,852	465
Company's use	963	....
Total for week	36,524	16,672
Previously this year	1,219,389	163,857
Total	1,255,913	180,529
Same time last year	1,076,786	218,375
Increase	179,127	dec. 37,846

Report of Coal Transported over Lehigh Valley Railroad

For the week ending May 8th, 1869, and previously this season, compared with same time last year:

WHERE SHIPPED FROM.	WEEK. Tons. Cwt.	TOTAL. Tons. Cwt.
WYOMING REGION.		
Franklin Coal Co	1,193 17	17,822 00
Audenried	....	
Lehigh and Susquehanna	....	
Germania Co	....	
Wilkesbarre Coal & Iron Co	....	595 15
Warrior Run	732 19	10,354 00
Parrish & Thomas	492 00	5,737 07
New Jersey	578 14	7,169 03
Union Coal Co	....	....
Wyoming Coal & Transportation Co	1,134 04	14,010 00
Newport Coal Co	....	....
Morris & Essex Mutual Coal Co	....	....
Consumers		....
Everhart Coal Co	....	....
Plymouth Coal Co	....	....
Hillman & Son	311 14	8,315 04
Bowkley, P & Co		44 18
Mineral Spring	647 04	12,294 02
Valley Coal Co	....	....
Enterprise Colliery	1,358 04	87,887 14
Burroughs	509 10	14,113 02
Washington Coal Co	....	....
West Pittston	....	180 16
Barclay Coal Co	....	....
Shawnee		5,641 17
Consumers Coal Co	....	4,890 01
Chas. Hutchinson		423 16
Harvey & Bro	164 05	1,954 03
Wyoming Valley	140 15	8,576 09
Henry Colliery	....	
Fall Creek		....
New England	124 10	8,140 04
Delaware & Hudson Coal Co		5,013 08
Maltby Colliery		1,344 07
Gaylord Colliery	356 04	1,862 03
Butler, H S M		
Tompkins	185 05	2,268 10
Chauncey Colliery	118 10	5,378 17
Ravine Colliery, P & E	....	
Maryland Anthracite		415 11
Rough & Ready		291 06
Rock Tunnel	....	
Butler Colliery	487 00	4,911 08
Other Shippers	....	33 11
Total Wyoming	8,534 15	179,168 18
Same time last year	3,244 09	105,112 19
Increase	5,290 06	73,455 19
Decrease	....	....
HAZLETON REGION.		
Central Coal Co	....	....
Ashburton Colliery, R. R. Carter	292 17	7,377 15
Mount Pleasant	304 06	8,377 08
Hazleton	4,984 05	109,189 09
Stockton—East Sugar Loaf	1,933 13	73,524 18
Mount Hall		
Latimer (A Pardee, Jr., Bro & Co.)	1,374 16	86,623 17
Stout Coal Co	492 09	20,471 19
Harleigh	1,141 08	39,241 11
Evervale Coal Co	993 06	35,988 09
Jeddo, (G B M & Co)	3,552 10	50,022 04
Woodside, J C Co	416 08	6,323 12
Highland Coal Co	369 15	4,874 15
Cross Creek	603 01	16,931 06
Council Ridge	2,108 12	52,906 05
Buck Mountain	1,230 03	29,821 14
Other Shippers	....	114 10
Total Hazleton	19,397 09	491,789 12
Same time last year	25,625 12	417,172 05
Increase		74,617 07
Decrease	6,228 03	.. ..
UPPER LEHIGH REGION.		
Upper Lehigh Coal Co	102 11	7,424 10
Same time last year	102 11	7,424 10
Increase		....
Decrease	414 06	18,042 09
B. M. REGION.		
Spring Brook	2,727 04	29,677 17
Honey Brook	2,799 11	41,697 06
German Pa. Coal Co	1,979 06	14,731 11
Spring Mountain	2 [illegible] 00	49,054 13
Coleraine	1,09 [illegible]19	29,444 11
B. Meadow, D. W		61 01
John Connery		
Lehigh Zinc Co		....
Stafford D W	53 02	900 03
Other Shippers	10 18	254 07
Total B M Region	11,452 00	165,821 14
Same time last year	7,199 16	147,195 14
Increase	4,252 04	18,626 00
Decrease	....	685 13
MAHANOY REGION.		
Mt Rose Coal Co		334 03
Mount Etna	320 07	1,682 03
Mahanoy Colliery	1,428 10	[illegible]4,696 08
Coplay Colliery	1,746 10	22,716 15
Glendon Colliery	1,252 07	12,154 19
Primrose Colliery	1,520 12	14,354 06
E S Silliman	1,298 19	17,688 18
McNeal Co	1,718 18	8,015 03
Knickerbocker	1,425 00	11,412 12
Thomas Coal Co	....	....
Mammoth Vein	456 12	2,688 11
New Boston Coal Company	1,636 08	10,835 01
Coal Mountain		675 01
Shamokin Coal Company		
Caledonia M & M		5,278 13
Richards & Humphreys	35 19	110 19
Other Shippers	....	9 17
Total Mahanoy	12,845 06	122,658 18
Same time last year	10,337 12	175,957 12
Increase	2,507 14	....
Decrease		53,298 14

WHERE SHIPPED FROM.	WEEK. Tons. Cwt.	TOTAL. Tons. Cwt.	PREVIOUSLY Tons. Cwt.
Total Mahanoy	12,845 06	122,658 18	109,813 12
Total B. Meadow	11,452 00	165,821 14	154,869 14
Total M. Chunk		124 04	124 04
Total U. Lehigh	102 11	7,424 10	7,321 19
Total Hazleton	19,397 09	491,789 12	472,392 03
Total Wyoming	8,534 15	179,168 18	170,634 03
Total	52,332 01	966,987 16	924,655 15
To L. & S. R., at Penn Haven for r'l		4,174 00	4,174 00
Do. for Canal	9,128 05	49,755 00	40,626 15
At Mauch Chunk for canal	3,681 07	24,498 11	20,817 04
Total Anthracite	65,141 13	1,045,967 10	980,273 14
Susquehanna region Bit. Coal, F. C'k.		552 03	552 03
Total by rail and canal	65,141 13	1,045,967 10	980,825 17
Same time last year	48,184 17	884,865 14	836,680 17
Increase	16,956 16	161,101 16	144,145 00
Decrease		....	....
Forwarded east from M. Chunk by r'l	51,223 01	936,164 09	884,941 08
Same time last year	46,924 06	871,505 11	824,581 05
Increase	4,298 15	64,658 18	60,360 03
Decrease		....	....
RECAPITULATION.			
Forwarded east from M. Chunk by r'l	51,223 01	936,164 09	884,941 08
Delivered at Mauch Chunk	15 18	566 19	551 01
Del. on line of r'd above M. C'k	269 16	4,753 08	4,483 12
Del. ab. M. C. for use of L. V. railr'd.	712 00	21,043 06	20,331 06
To L. & S. r'd at Penn Haven for rail		4,174 00	4,174 00
Do. for shipm't by canal	8,347 15	32,278 19	40,626 15
At Packerton	111 06	2,495 08	2,384 02
At M. Chunk for shipmen. by canal	3,681 07	24,498 11	20,817 04
To N. C. R. R., at Mt. Carmel		2,516 09	2,516 09
Total	65,141 13	1,045,967 10	980,825 17

Lehigh Canal Coal Trade.

Shipped for the week ending May 8, 1869.

WHERE FROM.	TONS. CWT.	TONS. CWT.
Mauch Chunk Region	10,426 18	48,671 17
Beaver Meadow Region	3,586 07	81,590 03
Mahanoy Region	95 00	737 01
Hazleton Region	9,128 15	45,570 14
Upper Lehigh Region	529 13	2,040 14
Wyoming Region	5,246 02	36,235 04
Total	29,012 15	154,845 15
Corresponding week last year	27,542 07	104,687 12
Increase	1,470 08	90,158 00
Decrease	....	....

Cumberland Coal Trade.

CANAL TRADE.—The following shipments by Chesapeake and Ohio Canal were made for the week ending Saturday, May 8—

American Company	3,710 17
Central	3,898 07
Consolidation	2,519 19
George's Creek C. & I.	990 07
Borden	2,101 11
Hampshire & Baltimore	1,410 13
Cumberland Coal and Iron	427 14
Midlothian	436 12
Total	15,496 00

By B. & O. RAILROAD.—The shipments over the Baltimore and Ohio Railroad, for the week ending May 8, were as follows:

From Cumberland and Pa. Railroad, via Cumberland	
Consolidation Company	1,953 15
Borden	1,221 08
Allegany	....
Midland	589 08
Midlothian	1,052 01
Cooke Mines	508 17
From George's Creek, via Piedmont.	
George's C. & I Company	1,960 06
Central	2,452 14
Atlantic	2,101 19
Savage Mt.	....
Swanton	1,212 19
Potomac	1,636 12
Piedmont	2 087 15
Franklin	1,866 17
Hampshire	1,185 01
Consolidation	11 17
Barton	498 13
From Eckhart RR.	
C. & I. Co.	2,246 00
Total	24,706 05

THE CANAL.—The Cumberland *Alleganian* says:—"We are glad to state that no damage resulted to the Chesapeake & Ohio Canal from the late rains. A brief interruption in the passage of boats occurred at Big Slack Water last week, in consequence of the high stage of water, but during the latter part of the week boats were arriving at Georgetown and Alexandria as usual. The Canal is in admirable condition throughout, and should no unforseen disaster transpire the tonnage will be largely in excess of any former year. The tonnage in the article of coal alone foots up 97,382 tons for the month of April, 1869, against 54,014 for April, 1868. Toll receipts for April, 1869, $42,305 96; against $30,279 66 for April, 1868."

Prices of Coal by the Cargo.

[CORRECTED WEEKLY.]

At New York, May 14, 1869.

Schuylkill R. A., choice	$ 6 00	Schuylkill Chestnut	$.... 5 00
" Ordinary	5 75	Lehigh W. A. Lump	6 00 ....
" W. A. Lump	.... 5 25	" Broken	5 35 ....
" Steamboat	.... 5 25	" Egg	5 35 ....
" Broken	5 50	" Stove	5 65 ....
" Egg	.... 5 50	" Chestnut	5 15 ....
" Stove	.... 5 75	Shamokin	.... 5 00

SPECIAL COALS.—DEALERS' QUOTATIONS.

Diam'd Vein R. A., Sch'kill	.... 6 00		
Locust Dale W. A., "	5 75		
Honey Brook " Lehigh	6 00 5 15	Buck Mountain	5 50
Harleigh " "	6 00 5 15	Fulton	6 00 5 15
Spring M'n " "	6 00 5 15	Stout	6 00 5 15
Sugar Creek " "	6 00 5 15	New England Red Ash	....
Sugar Loaf " "	6 00 5 15		

Dealers in these Coals may be found in our advertising columns.

At Philadelphia, May 13, 1869.

Lehigh L'p and St'mb't	6 00	" Egg and Stove	
" Broken and Egg	6 00	" Chestnut	
" Stove	6 25	Locust Mount Lump	
" Chestnut	5 50	" Steamboat	
Schuylkill R. A		" Broken	
" Chestnut		" Egg	
" W. A. Lump		" Stove	
" Broken		" Chestnut	

SPECIAL COALS.—DEALER'S QUOATIONS.

Lorberry Coal	Burnside R. A. Egg & St.
Shamokin	
Franklin, (Lykens Val.)	Hill & Harris, Egg & St.
Broad Top	Henry Clay, Egg & St.

Dealers in these coals may be found in our advertising columns.

Powelton Coal at Philadelphia, May, 1869.

Powelton Egg and Stove	$5 50
Powelton Semi Bituminous	5 25
Powelton Gas	$7 80

Scranton Coal at Elizabethport, May, 1869.

(Corrected weekly by D. L. & W. R. R. Co.

Lump	5 00	Egg	.... 5 00
Steamer	5 00	Stove	.... 5 50
Grate	5 00	Chestnut	.... 5 00

Prices for Pittston Coal at Newburgh, May, 1869.

(Corrected weekly by Penna. Coal Co.)

Lump, per ton, 2240 lbs.	....	Egg " "	....
Steamer, " "	....	Stove " "	....
Grate " "	....	Chestnut " "	....

70c. Freight to New York.

Lackawanna at Rondout, May, 1869.

Lump		Egg	....
Steamer		Stove	....
Grate		Chestnut	....

65 cents Freight to New York.

Old Company's Lehigh Coal at Mauch Chunk.

May, 1869.

Lehigh L'p and Steamboat	$	Stove	$3 25
Broken and Egg		Chestnut	3 75

Lehigh Coal at Elizabethport, May, 1869.

Lump	....	Stove	....
Steamboat and Broken	....	Chestnut	....
Egg	....		

50c. Freight to New York.

Wilkesbarre Coal at Hoboken, May, 1869.

(Corrected by Wilkesbarre Coal & Iron Co.)

Lump	....	Egg	....
Steamer	....	Stove	....
Broken	....	Chestnut	....

45 cents Freight to New York.

At Baltimore, April, 1869.

Wholesale prices to trade.		Trevorton R. A	$ 5 40
Wilkesbarre by cargo or car load	$ 5 60	By retail, per ton of 2,240 lbs., delivered	8 00 8 50
Pittston and Plymouth	5 40 5 65	Georges C'k & Cumberland f. o. b. at Locust Point for shipping	.... 5 00
Shamokin R., or W. Ash	.... 5 40		
Lykens Valley, R. A	.... 5 65		

At Havre de Grace, Md.

Cargo prices for shipment south of Patapsco River, (drawback allowed of 10 per centum.)		Shamokin R. or W. Ash	$.... @....
		Lykens Valley R. A	....
Wilkesbarre and Pittston		Trevorton R. A	....
W. Ash	$.... @....		

At Georgetown, D. C. and Alexandria, Va.

George's Creek and Cumberland f. o. b. .... @4 75

Prices of Gas Coals.

April, 1869.

PROVINCIAL. Duty, $1 25	Coarse. Gold.	Slack. Gold.	AMERICAN.	Coarse. Currency.	Slack. Currency.
Block House	$1 75 @$	75	Westmoreland Co	8 75	
Gowrie	1 75	75	Despard Coal Co	8 50	8 00
Lingan	1 75	75	Penn		
Sydney	2 18½	71½	Newburgh Orrel Gas	8 50	8 00
Pictou	2 13½	1 18½	West Fairmont Gas Coal		7 00
Little Glace Bay	1 50	1 00			
Caledonia	1 50	75			

Prices of Foreign Coals.

April.

Duty, $1 25 per ton.

Corrected weekly by PARMELEE BROS., 32 Pine Street, N. Y.

Liverpool Gas Caking	$ 9 50	Liverpool House Cannel	18 00 19 00
" " Cannel	14 00	" " Orrel	16 00 18 00

Per ton 2240 lbs., Ex. ship.

PRICES FROM YARD.

Liverp'l House Orrel, scr'd	$16@18	Liverp'l House Can'l, scr'd	$18 00 20 00

Per ton 2000 lb., delivered.

Coal Freights.

(Corrected Weekly).

Freights on Coal Sea-borne from Port Richmond, Philadelphia.

April, 29, 1869.— From Philadelphia and Reading R. R. Wharves, Phila., to

Bangor	....	New London	— — 1 80
Boston	2 50	Dover	— — 2 50
Providence	2 00	Cohasset Narrows	— — 2 50
Lynn	and discharging 2 50	Cambridgeport	— — 2 75
Portland	2 00 2 50	Dorchester	— — 2 50
Fall River	2 00	Fair Haven	— — 2 00
New Bedford	2 00	Gloucester	— — 2 75
Salem	2 50	Lawrence	— — 3 00
Newport	— — 2 00	Old Cambridge	— — 2 53
East Cambridge	— — 2 50	Saco	— — 2 75
Newburyport	— —	Roxbury	— — 2 75
Portsmouth	— — 2 75	Salisbury	— — 2 75
Charleston	1 75 2 00	Greenport	— — 2 00
Danversport	and discharging 2 50	Norwich	— — 2 00
Amesbury	— — 2 75	Harlem	— — 1 45
Beverly	2 50	New Rochelle	1 30 1 40
Charlestown	2 50	Sag Harbor	— — 1 50
Hingham	2 50	Spuyten Duyvel	— — 1 35
Marblehead	2 50	Williamsburg	— — 1 35
Nantucket	— — 2 50	Jersey City	— — 1 35
Plymouth	— — 2 50	New Brunswick	— — 1 20
Provincetown	— — 2 25	Alexandria	— — 1 25
Washington	— — 1 25	Fredericksburg	— — 2 00
Calais	— — 2 75	Wilmington, Del	— — 75
Machiasport	— — 2 75	Bath	2 50
Hoboken	1 35	East Greenwich	2 00
Hyannis	2 25	Albany	1 95
Malden	275	New York	2 10
Nahant	and discharge 2 50	Troy	2 10
Weymouth	and towing 2 50		

Provincial Freights.

TO NEW YORK.		TO BOSTON.	
Sydney	$3 50	Sydney	$3 00
Lingan	3 50	Lingan	3 00
Cow Bay		Cow Bay	
Port Calidonia	3 50	Port Calidonia	3 00
Little Glace Bay	3 50	Little Glace Bay	3 25

From Elizabethport and Port Johnson.

Albany	$ 90@— —	New London	$1 15 — —
Boston	1 75 — —	Newport	1 40 — —
Bridgeport	1 — — —	New York	50 — —
Fall River	1 40 — —	Norwalk	1 — —
Hartford	1 50 — —	Norwich	1 25 — —
Hudson	1 00 — —	Pawtucket and towing	— —
Wareham	— —	Portland	1 75
Middletown	1 25 — —	Portsmouth	1 75
New Bedford	1 40 — —	Providence	1 40 — —
Newburyport	2 00 — —	Salem	1 75 — —
New Haven	1 00 — —	Augusta	3 00 — —
		New Orleans	3 00 — —

Foreign Freights.

New Castle and Ports on Tyne	£15@£18 keel.		
Liverpool	18.@20s. ton.		
Australian	9 50@10 00	Lehigh	15 50@16 00
do. Wallsend	10 00 10 50	Liverpool	13 00 ....
Bellingham Bay	11 00	Pittston, ton	14 50 15 00
California	7 00 9 00	Scranton	14 00 15 00
Cumberland cks	30 00 22 00	Scotch	13 00 ....
do bulk	28 00	Vancouver Island	12 50 ....
Chili	10 00		

Rates of Transportation to Tide Water.

[BY RAILROAD.]

To Port Richmond, Philadelphia.

Philadelphia and Reading Railroad, from Schuylkill Haven $2 00

The following are the drawbacks allowed on all coal shipped East of New Brunswick and South of Cape Henry, until further notice.

	Drawback.	Freight.	Nett
Lump	90	$2 ..	$1 10
Steamboat	90	2 ..	1 10
Broken	70	2 ..	1 30
Egg	70	2 ..	1 30
Stove	50	2 ..	1 50
Chestnut	70	2 ..	1 30

From Port Carbon, 8 cents per ton more.

To Elizabethport.

L. V. Railroad from Mauch Chunk to Easton	$ 81
C. R. R., N. J., Easton to Elizabethport	1 22
	2 03
Shipping Expenses at Elizabethport	25
Total	2 28

To Port Johnson.

L. V. R. R.	$ 81
C. R. R. of N. J.	1 29
Shipping Expenses	25
Total	2 35

To Hoboken.

L. V. R.R.	81
Morris & Essex R.R.	1 29
Shipping Expenses	25
Total	$2 35

[BY CANAL.]

To New York (Morris.)

Lehigh Canal Tolls	40
Morris Canal Tolls	45
Frieght	$1 55
Towing	10
Total	$2 50

To New York (Delaware and Raritan.)

Lehigh Canal Tolls	40
Delaware Division Tolls	30
Delaware & Raritan Tolls	35
Freight	$1 25
Towing from New Brunswick	20
Total	$2 50

SAN FRANCISCO STOCK MARKET.

A telegram from San Francisco, dated May 12, quotes:

STOCKS.	Per Sh.		SHARES.	Per Sh.	
Gould & Curry	119@	117	Belcher	19	
Savage	106	107	Imperial	94	95
Chollar Potosi	240	242	Alpha	36	39
Hale & Norcross	190	185	Amador	269	
Crown Point	68	67	Kentuck	255	
Yellow Jacket	70	71	Ophir	27	28

ASSESSMENT—Belcher Mining Co., $5 in coin per share. Delinquent June 5th. Sale June 24th, 1869.

New York, May 13th, 1869.

DIVIDEND—Savage Mining Co., $4 in coin per share, payable 12th inst.

Copper Stocks at Boston.

BOSTON, May 14, 1869.

The following are the prices of mining stocks bid in Boston this day:

Copper Falls	8	Quincy	95
Franklin	19	Cary Improvement	8¼
Hancock	4	Hecla	75
Minnesota		Bos. Hart. & Erie R. R.	22½
Calumet		Isle Royal	..
Water Power	17½		

Contributions to the History of Explosive Agents.*

BY F. A. ABEL, F. R. S., FOR. SEC. C. S.

The degree of rapidity with which an explosive substance undergoes metamorphosis, as also the nature and results of such change, are, in the greater number of instances, susceptible of several modifications by variation of the circumstances under which the condition essential to chemical change are fulfilled.

Excellent illustrations of the modes by which such modifications may be brought about are furnished by gun-cotton, which may be made to burn very slowly, almost without flame, to inflame with great rapidity but without development of great explosive force, or to exercise a violent destructive action, according as the mode of applying heat, the circumstances attending such application of heat, and the mechanical condition of the explosive agent, are modified.† The character of explosion and the mechanical force developed, within given periods, by the metamorphosis of explosive mixtures, such as gunpowder, is similarly subject to modifications; and even the most violent explosive compounds known (the mercuric and silver fulminates, and the chloride and iodide of nitrogen) behave in very different ways under the operation of heat or other disturbing influences, according to the circumstances which attend the metamorphosis of the explosive agent (*e. g.*, the position of the source of heat with reference to the mass of the substance to be exploded, or the extent of initial resistance opposed to the escape of the products of explosion).

Some new and striking illustrations have been obtained of the susceptibility to modification in explosive action possessed by these substances.

The product of the action of nitric acid upon glycerine, known as nitro-glycerine, which bears a remarkable resemblance to chloride of nitrogen in its power of sudden explosion, requires the fulfilment of special conditions for the development of its explosive force. Its explosion by the simple application of heat can only be accomplished if the source of heat be applied, for a protracted period, in such a way that chemical decomposition is established in some portion of the mass, and is favored by the continued application of heat to that part. Under these circumstances, the chemical change proceeds with very rapidly accelerating violence, and the sudden transformation into gaseous products of the heated portion eventually results in a transformation which is instantly communicated throughout the mass of nitro-glycerine, so that confinement of the substance is not necessary to develop its full explosive force. This result can be obtained more expeditiously and with greater certainty by exposing the substance to the concussive action of a detonation produced by the ignition of a small quantity of fulminating powder, closely confined and placed in contact with, or proximity to, the nitro-glycerine.

The development of the violent explosive action of nitro-glycerine, freely exposed to air, through the agency of a detonation, was regarded until recently as a peculiarity of that substance; it is now demonstrated that gun-cotton and other explosive compounds and mixtures do not necessarily require confinement for the full development of their explosive force, but that this result is attainable (and very readily in some instances, especially in the case of gun-cotton) by means similar to those applied in the case of nitro-glycerine.

The manner in which a detonation operates in determining the violent explosion of gun-cotton, nitro-glycerine, etc., has been made the subject of careful investigation. It is demonstrated experimentally that the result cannot be ascribed to the direct operation of the heat developed by the chemical changes of the charge of detonating material used as the exploding agent. An experimental comparison of the mechanical force exerted by different explosive compounds, and by the same compound employed in different ways, has shown that the remarkable power possessed by the explosion of small quantities of certain bodies (the mercuric and silver fulminates) to accomplish the detonation of gun-cotton, while comparatively very large quantities of other highly explosive agents are incapable of producing that result, is generally accounted for satisfactorily by the difference in the amount of force suddenly brought to bear in the different instances upon some portion of the mass operated upon. Most generally, therefore, the degree of facility with which the detonation of a substance will develope similar change in a neighboring explosive substance, may be regarded as proportionate to the amount of force developed within the shortest period of time by that detonation, the latter being, in fact analogous in its operation to that of a blow from a hammer or of the impact of a projectile.

Several remarkable results of an exceptional character have been obtained, which indicate that the development of explosive force under the circumstances referred to, is not always simple, ascribable to the sudden operation of mechanical force. These were especially observed in the course of a comparison of the condition essential to the detonation of gun-cotton and of nitro-glycerine by means of particular explosive agents (chloride of nitrogen, &c.), as well as in an examination into the effects produced upon each other by the detonation of those two substances.

The explanation offered of these exceptional results is to the effect that the vibrations attendant upon a particular explosion, if synchronous with those which would result from the explosion of a neighboring substance in a state of high chemical tension, will by their tendency to develope those vibrations, either determine the explosion of that substance, or at any rate greatly aid the disturbing effect of mechanical force suddenly applied, while, in the instance of another explosion, which developes vibratory impulses of different character, the mechanical force applied through its agency has to operate with little or no aid; greater force, or a more powerful detonation, being therefore required in the latter instance to accomplish the same result.

* Abstract of a paper read before the Royal Society, April 15, 1869, prepared by the London *Chemical News*.

† Proceedings of the Royal Society, vol. xiii., 205 *et seq.*

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NEW YORK, SATURDAY, MAY 15, 1869.

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In consequence of a new regulation recently adopted by the Postmaster of this city to facilitate the early delivery of mail matter, we have to request our correspondents, in addressing us, to give the number of our post-office box, No. 5,969, in lieu of, or in Connection with our business office address. Also, write JOURNAL OF MINING, instead of *Mining Journal*, to ensure safe carriage.

HOW TO OVERCOME ENGINEERING DIFFICULTIES.

At one of the meetings of the Institution of Naval Architects, recently held in London, Mr. SCOTT RUSSELL, in a long self-laudatory speech, explained how he had overcome certain engineering difficulties in carrying trains of cars across the Bodensee, or Lake of Constance, in Switzerland. The aim of his remarks was to show that, since the difficulties in crossing the channel from Dover to Calais are not greater than those which present themselves in Switzerland, nor of a very different character, it is a shame to both France and England that no better means of transit have yet been provided between the foremost two nations of Europe.

Travelers across the channel are compeled to leave their comfortable railroad coaches, to embark in vessels so small as to expose them to sea-sickness, and, finally, to disembark and go on board another train. Besides this inconvenience to travelers, there is enormous loss of time and labor in loading and unloading merchandize, which would be avoided if the loaded freight cars could pass from Paris to London and *vice versa*, without breaking bulk. To all this we, of course, fully agree, and say "Amen."

But we cannot join in the compliments Mr. SCOTT RUSSELL is paying himself with regard to the transit across the Lake of Constance. American engineers solved a similar problem twenty years ago by the very same device as that which he now calls his new invention. Our New York and Washington railroad trains, locomotives and all, were for many years transported across Chesapeake Bay on a large steamboat, having three tracks on deck, which connected by means of bridges or landings with the shore track. These bridges were raised or lowered, according to the state of the tides. The trains, as they approached, were divided into three equal sections, the front section with locomotive remaining on the middle track, while the two other sections were switched off on the side tracks. All that the passengers observed was, that when the train stopped it was divided into three sections on three parallel tracks, and, without any delay, was pushed or pulled by its own locomotive over the inclined bridge on board of the steamer, which immediately left the shore. This steamer had two independent engines, the shafts of the wheels not being connected. This arrangement, by the way, is very common in our American waters. It may be observed, for instance, on the Ohio River, where the boats have to make short turns, which they accomplish by the revolution of one wheel only, or by the forward revolution of one wheel, while the motion of the other is reversed. Such boats can even be handled without rudders. All these advantages have, from time to time, attracted the attention of foreign engineers, and were noticed some thirty years ago in divers engineering and scientific journals; as, for instance, in DINGLER'S *Polytechnic Journal*, PRECHT'S *Technologischen Berichten*, etc. The French and German journals are more ready to publish and acknowledge American novelties than their English contemporaries, which frequently ignore important American inventions, to the great disadvantage of their own nation, as the case of Mr. SCOTT RUSSELL, now in question, forcibly demonstrates.

We will only add here, with reference to the transit of American railroad trains across the Chesapeake Bay, that it occupied only about half an hour, which gave the passengers time to partake of lunch between decks, where a large refeshment room, about three hundred feet long by sixty feet wide, afforded during each crossing the needful accommodations to several hundred passengers. The boat being alike at both ends, having two rudders (like all our American steam ferry-boats, of which scores may be seen in New York) landed at the other side without turning round; and the locomotive pulled the three parallel trains from the boat across the bridge in the same manner as it had previously pushed them aboard. Once ashore, the cars were again switched upon the same track and coupled, and within an hour from the time of arriving at the bay the train was again pursuing its course. As most of our readers are aware, this system has been given up, because our American engineers established the possibility of building a bridge across the Chesapeake, or rather across the mouth of the Susquehanna River, at the point where it enters the bay. The river is at this point two miles wide, and the bridge over it was completed two years ago, at a cost of far more than a million dollars. It has spans of 80 feet, and a draw to permit the passage of vessels. This bridge was constructed, not because the steamboat ferry system did not give satisfaction, but because the travel increased at such a rate as to demand longer trains than the boat could contain. To avoid the delay incident to repeated trips, more boats had to be provided. The decisive consideration was the fact that the interest of the capital employed in building even a very expensive bridge, added to the cost of keeping it in proper repair, was far below the cost of running the steamers. If we are not mistaken, however, the steamboat arrangements are still kept on hand for use, in case of possible interruption in the bridge communication.

Such engineering feats are so common in this country that our engineers do not boast about them, but consider them matters of course. The press, for the same reason, is usually silent on the matter, or chronicles only its commercial aspect; consequently, the general portion of the public, which never admires anything unless told beforehand what and wherefore to admire, knows nothing about them.

Let us now consider, somewhat in detail, the remarks of Mr. SCOTT RUSSELL. The degree of novelty attaching to his engineering contrivances will appear in a strong light, as we compare them with American precedents. Mr. RUSSELL said:

"He was called upon to solve the problem of effecting communication between the railways on the two sides of the lake. The problem they set him was, 'What we want is that you will make us the nearest thing you can to a railway, in order that we may let our trains, with their locomotive engines and everything, go across the lake as if it were a railway.' Well, that was not difficult to do. The only difficulty was to do it well, cheaply, and in such a manner as to suit the peculiar circumstances of the case. The peculiar circumstances of the case were these: That at the entrance of the harbors the channels were shallow, not more than six feet deep. Another difficulty was a change of level of water, amounting to twelve feet from one extreme to the other. It was true this level did not change every day as at Dover, but it did change periodically, and therefore it was necessary to have a similar provision."

In the Chesapeake the ocean tides cause a daily change, which, in certain directions of the wind, greatly exceeds the usual ebb and flow. But Mr. RUSSELL was equal to the strange emergency:

"Having stated the peculiar circumstances of the case, he would shortly describe the manner in which those circumstances were met, and he would also state the results, because it would show that the difficulties between Dover and Calais could be met in a similar way. If he was asked the comparative difficulty of the two problems, he could not say that one problem was more difficult than the other. He had solved the Dover and Calais problem three years ago in plans, but he found that he had an enormous deal to learn and contrive before he could solve this particular problem in Switzerland. He proceeded to show how this problem was solved.

"In the first place, he said to himself, 'If they want me to continue the railway across the sea, I had better take a slice of the railway station, put a train and an engine into it, and send it over to the other side, and a train will then go on.' He therefore took a section of a railway station 22 feet wide, and put upon that two lines of rail on one side and two lines of rail on the other side, leaving these two lines of rail to receive two railway trains. He had then to let in a locomotive engine, and so he had to make the roof of his railway station as high as a railway bridge, or a little higher than the top of the engine chimney.

"The next thing was to float this bit of a railway station. Of course that was very easily done. He had only to put a construction below it in the nature of a ship, and, as there was only 6 feet of water, he had to take care that his vessel only drew 6 feet of water. Having got to propel the vessel, he had to place an engine room and boiler on each side, each 9 feet wide, making, with the 22 feet of railway, a total width of 40 feet. The boat had next to be fitted with paddles, which occupy a space of 10 feet on each side. So that, altogether, the structure was 60 feet beam. And when he stated that the harbors were from 80 feet to 100 feet wide at the entrance, and that he had to enter these harbors in hurricanes in shallow water, at a low velocity, with scarcely any steerage power, it would be seen that the task was not very easy.

"Perhaps he ought to say a word about the engines. At the beginning there were a few particulars that bothered him. He wanted to get the paddle-shaft all through, but he could not. If he put it below it was too low; if he put it above it was too high; so he gave it up altogether, and simply put upon the shaft of each paddle-wheel a couple of oscillating engines—one before the axle and one behind the axle. So he had a pair of engines to each wheel, perfectly independent of one another. A nautical friend would say to him, 'You will get into precious difficulties with them.' He knew he should. He knew very well that in a heavy wind, when one paddle-wheel was deeper than the other, one engine would be flying away, and the other would be working very slowly. To counteract that he took a little indicator from the right engine room into the left engine room, and another indicator from the left engine room into the right engine room; and he made these indicators go round in the face of the engineer, so that he could not help looking at them when he was starting, or reversing, or moderating his engine. By this means engineer A was always looking at indicator B, and engineer B was always looking at indicator A; and in three days they had acquired such skill in handling the engines that engine A and engine B never advanced half a turn upon each other."

As before remarked, such engines are a common thing in this country. Our engineers went through this school forty years ago.

"These were the difficulties he had on the cross section. There were also difficulties on the longitudinal section. On the line of rails he had to put his wagons, eight wagons on each line. German wagons were desperately long; but, having two lines of rails, he was enabled to carry nineteen wagons in all."

American wagons are considerably larger than the German, and, using three lines of rails, we placed still more on board our boats.

"The next difficulty was owing to the varying height of the water and the varying immersions of the vessel according to its loading. He had to provide for a variation of 12 feet of water, 6 feet one way and 6 feet the other way. He managed it in this simple way: He made a railway bridge of steel 60 feet long, one end supported on the land and the other end was in the air. How did he get it into the air? Very easily. He merely put up on one side of this railway bridge a huge pillar of cast iron on the land. On the top of this pillar he put a great cast iron wheel, and round the wheel he put a chain cable. He attached one end of the chain cable to the bridge, and to the other end of the chain cable he attached a big weight half as heavy as the bridge. On the opposite side of the railway bridge he had another pillar, another wheel, another weight half as heavy as the bridge. Thus balanced, the railway bridge would remain in the air wherever you pleased to put it. But it was not content to stay there when the weight of the train was upon it; therefore it was necessary to keep it there by some other means, and so the chain was continued from the bottom of the weight round the wheel to a crane. When there was no weight on the bridge, if you gave a turn or two to the crane, the bridge got the proper level; then they made fast to the crane, and the railway train went over the bridge. That was all; there was no merit in the contrivance. On the opposite shore there was another bridge hanging in the air, counterpoised by similar weights. The vessel oscillated only between those two points."

We not only solved this problem in the case of the Chesapeake railroad ferry, but in all our steamboat ferries, as Mr. RUSSELL might find out by coming to New York, or even by inspecting the drawings of New York ferry-boats, furnished some years ago to the LAIRDS, of Birkenhead, at their own request. Here he could see some fifty such bridges, having their movable end suspended in the air.

"But it would be said that there must be little difficulties when the water was very high and when it was very low. Of course there were little difficulties, but they were met by little expedients. When the water was very low the bridge came a good deal over on the point of the boat and overlapped. There was a line of rail which ran down to each of the rails on the boat, and he need hardly tell a good engineer that as the boat 'waggled' from one side to the other, he must make the bridge limp, so that it could 'waggle' also, so that the train did not run off the rails. The bridge was made by a very good mechanical engineer, and for the life of him he could not get him to make any of his joints slack, so as to make the structure 'wiggle-waggle.' At last he did succeed in getting him to make the holes so big for the pins that the joints could 'wiggle-waggle.' This done, all difficulties disappeared.

"A good locomotive engine-man could very easily drive his engine up an incline which was not more than four or five feet in a length of 60 feet or 70 feet. True it was a deep incline, but it was so short that there could not be many wagons at a time on it, so that, while one or two wagons were on the incline, the others would be on the level; thus any ordinary locomotive engine went up the incline without knowing it was on an incline. It might be said there would be a difficulty in coming down. There was a difficulty, and he expected the railway locomotive staff would have to undergo an education. He did not know any other way of making them undergo a thorough education than by letting them make some horrible blunder. He got the company to let him have a train of the oldest wagons they possessed. He told them secretly to make every preparation for taking the wagons out of harbor. He got the oldest locomotive engine they had, and he took care that the fireman and driver could swim. He found the brakesmen could not swim, and on reflection he was glad of it, because they seemed dreadfully afraid of getting in, and the consequence was that not one of the brakesmen ever allowed a carriage to pass the chalk mark which he had drawn on the deck, because he could not swim."

It is true that on board our Chesapeake steam ferry we did not have a chalk-mark to prevent the brakesman from running the cars into the water. As engineers, we cheerfully admit the originality of this part of Mr. RUSSELL'S machinery; but, as passengers, we should prefer the old-fashioned, simple, strong, American buffer-post, which made

it impossible for the train to go any further, whether the brakesman could swim or not.

"Having made these arrangements, the practical result was, that by beginning gradually, and going on gradually, and giving the men a fortnight to learn, by making them put in trains and take out trains every day faster and faster, first with one carriage, then with two carriages, then with three, and ending with the locomotive engine, they at last acquired the power of doing all these things, which they thought at the beginning were impossibilities. These impossibilities were so accomplished that the term the people applied to the formidable enterprise, as they thought it, of putting a locomotive and train on board, *Kinderspiel*, which meant 'child's play.' There was no merit in all this, but there was one advantage, and that was simplicity. There was no machinery required, no fixed engines, no inclined planes, no moving machinery of any kind; there was simply a railway station, and all the appendages on both sides were nothing more than the common appendages of a railway station. Therefore he was proud of the word *Kinderspiel*."

It is just barely possible that the natives of that ignorant country, Switzerland, where they only have about a dozen times as much scientific education in proportion to their population as England, used the term *Kinderspiel*, with reference to Mr. RUSSELL'S non-amphibious brakesman and chalk-line, in a satirical rather than a complimentary sense. We have scarcely time to follow him through his "solutions" of other "problems"—such as the "difficulty down stairs" in the engine room, which rendered it impossible to say "go ahead" or "go astern," "because the engineers could not tell which end was meant for the stem and which for the stern." Our solution has been for a generation to say neither, but to give bell-signals. Mr. RUSSELL, of course, found out a better way, which was to "overcome" the difficulty by a long course of instruction imparted to the captain and all hands. Mr. SCOTT RUSSELL built the engines for the Great Eastern, the success of which does not entitle him to instruct navigators, even on Swiss lakes, though perhaps those somewhat notorious machines might have been adequate to the propulsion of a ferry-boat. But we must have patience with the overweening conceit of John Bull.

It was scarcely necessary or becoming, however, for the *Scientific American* to publish the whole of this tirade of vanity without a word of correction or comment, as though it were a new revelation of scientific progress from the tripod of inspiration. Did the distinguished patent agents who run that concern never go to Washington via the Chesapeake ferry? Or do they disbelieve in the existence of that institution, because it was never patented through their office, illustrated by their artists, and then, in the natural course of events, puffed in their columns through all remaining time?

MEASURING THE HORSE-POWER OF STEAM ENGINES.

During the infancy of the steam engine it was supposed that in order to find the actual power in foot-pounds per minute, which a given engine should produce, all we had to do was to take the pressure of the steam in the boiler in pounds per square inch, multiply this into the surface of the piston, also in square inches, and finally to multiply this into the distance in feet passed over by the piston in a minute. If, for instance, the pressure in the boiler was 20 pounds, the surface of the piston 200 square inches, and the length of stroke 2 feet, with 100 strokes per minute, the number of foot-pounds to be obtained was supposed to be $20\times200\times2\times100=800{,}000$ per minute. This quantity, didided by 33,000, the number of foot-pounds adopted as equal to one horse-power, gives 24.25 horse-power.

Experience proved, however, that the actual amount of horse-power was far below this result, and, moreover, that when the engine, by having less work to perform, was caused to run faster, the same calculation gave a greater power—a result which seemed to be absurd. This old observation has been quite recently republished as a novelty.

To satisfy the conditions of practice, the following empirical rule was adopted: On the authority of WATT, the speed of a piston with a two foot stroke was assumed to be 160 feet per minute; with a 2 feet 6 inch stroke, 170; 3 feet, 180; 3 feet 6 inches, 189; 4 feet, 200; 5 feet, 215; 6 feet, 228; 7 feet, 245; 8 feet, 266. These numbers are founded upon the experimental observation, that the speed of the piston varies nearly as the cube root of the length of the stroke. It was also assumed that the effective pressure on the piston is only 7 pounds per square inch; and the horse-power was determined by multiplying the diameter of the cylinder in inches into the velocity of the piston in feet per minute, and dividing the product by 6,000. In the illustration already given, the piston of 200 square inches surface, or 16 inches diameter, and 2 feet stroke, would exert 162×160 divided by 6,000, or nearly 7 horse-power.

This process gave a reasonably accurate standard of measurement as compared with the results of practice, and it was therefore adopted as a rule for finding the so-called nominal horse-power.

Later improvements, however, combined with stronger boilers and higher initial pressure, increased the power of steam engines considerably above that indicated by the above rule; and a distinction was made between nominal horse-power and actual horse-power, the latter having become two, three and sometimes even four and five times as great as the former. The nominal horse-power is, in fact, at the present day, a mere conventional expression, serving to convey by a simple number an approximate idea of the size of a steam engine.

Until about half a century ago, it was supposed that the disagreement between the practical results, as indicated by the nominal horse-power, and the theoretical results obtained by calculating the amount of steam pressure in the boiler and the motion of the piston (one being, in the example given, 7 horse-power, and the other 24), was due to friction, imperfection of machinery, loss of power by the use of the crank, etc.

It was DE PAMBOUR, in France, who, half a century ago, first pointed out the absurdity of the supposition, that, in well-made steam engines, the loss by friction and imperfection of the mechanical arrangements could amount to three-fourths of the power employed. He demonstrated the fact, overlooked by his predecessors, that the pressure on the piston never can equal the pressure of the steam in the boiler, because the steam has to follow the receding piston. He also showed that, the longer the connecting tubes between boiler and cylinder, or the greater the number of bends in them, the more serious is the proportion of loss. To this, again, must be added the cooling of the steam in the cylinder, the temperature of which is always considerably below that of the boilers. DE PAMBOUR pointed out that when the pressure of steam, not in the boiler, but in the cylinder, during the motion of the piston, is taken as the basis of calculation, the results from the theoretical rule agreed with the actual power obtained from the engine.

In order, now, to ascertain this pressure of steam on the receding piston, an instrument called the indicator is used. It is a miniature cylinder and piston, attached to the cylinder of the engine; and it indicates and registers the pressure of the steam on the miniature piston by compressing a spring. The amount of pressure in the main cylinder at every part of the stroke, when the engine is in motion, is thus recorded.

The principle on which this indicator is constructed was discovered by the immortal JAMES WATT, who, at a very early period of his inventions, employed it chiefly to ascertain the proportion which the vacuum in the cylinder bore, at different parts of the stroke, to that in the condenser, in order that he might determine the dimensions of cylinder required for any desired power, as well as the proportion to be given to the steam and exhaust parts, etc. Succeeding mechanics seem to have despised the unpretending little instrument, by the assistance of which WATT had been led to such splendid results, and for half a century have trusted either to the absolute correctness of WATT'S data or to their own, often extremely fallacious, theoretical deductions.

It was only at a comparatively recent period that the indicator was rescued from its oblivion by DE PAMBOUR, in France, and MACNAUGHT, in Scotland, the latter of whom brought it to a compact and portable form, easily applied to any steam engine. Its resurrection materially elevated the standard of duty of steam engines, and demonstrated the economy of using the expansive power of steam, and the advantage attendant upon a more rapid and complete exhaustion than could be attained by the arrangement of the slide-valves previously employed.

Another important application of the indicator, more recently introduced, is the invention of a sure method for measuring the amount of power used by any piece of machinery moved by a steam engine. This, of course, is of great advantage to those who let steam power; since the lessee is thus prevented from actually using four or six horse-power while paying for only two. To ascertain this, the actual power exerted by the engine is measured by means of the indicator, both before and after the special piece of machinery is connected. The difference between the two observations gives, of course, the amount of power consumed by the piece of machinery.

The description of the indicator and its use forms a proper subject for a future article. We shall hope to remove the impressions under which those gentlemen are laboring, who appear not to be aware that steam-power *is correctly measured* by this means, and who continually suggest new methods, or raise objections which were long ago overthrown.

ELECTRICITY AS A MOTIVE POWER—M. GREIL'S TABLE.

We may add to the article under this head in our last number, that twenty years ago, when the excitement concerning the substitution of electro-magnetic power for steam was at its height, the celebrated German chemist, LIEBIG, raised his voice against it, and was the first who, on purely theoretical grounds, asserted that as an agent for the generation of power, 64 pounds of zinc could not be worth more than 6 lbs. of coal. He also pointed out that magnetic attraction, however strong at contact, or within very short distances, becomes exceedingly weak when the attracting magnets are moving through measurable spaces. The history of science has shown, in this as in other cases, of how little avail is sound advice when opposed to sanguine, though unfounded, expectations.

The table of M. GREIL, as given last week, was rendered inaccurate by a serious typographical error. That gentleman employs the letter D to denote the expense of two horse-power obtained by steam, and D' the expense when obtained by electricity. The table should read as follows:

Horse-power obtained.	Expense	
	Steam.	Electricity.
2	D	D'
16	8 D	2 D'
46	32 D	3 D'
250	125 D	5 D'
2000	1000 D	10 D'

Now, he asserts that D' is only 25 D, or, in other words, that the expense of two horse-power obtained by electricity is 25 times as great as when obtained by steam. Substituting this value, and assuming D, or the cost of two horse-power by steam, as the result of measurement, the table becomes:

Horse-power obtained.	Expense	
	Steam.	Electricity.
2	1	25
16	8	50
46	32	75
250	125	125
2000	1000	250

We have shown that electricity costs about a thousand times more than steam, and we can see no ground whatever for the assertion that the expense will not increase in the same ratio as the power obtained. The following table is therefore more likely to be near the truth than are the assertions of those who are recommending new and wonderful electro-magnetic engines:

Horse-power obtained.	Expense.	
	Steam.	Electricity.
2	1	1000
16	8	8000
64	32	32,000
250	125.	125,000
2000	1000	1,000,000

The consumption of coal for every two horse-power of an engine is nearly two lbs., or one dollar's worth in 24 hours. The above figures may therefore be taken as representing dollars, and the frightful expense of the electro-magnetic engine becomes apparent.

We do not assert the utter impossibility of ultimately using electricity as a motive power. We repeat, however, that, so long as no sources of electric currents are employed cheaper than zinc and acids, such attempts are entirely premature. ERICSSON is now attempting to obtain a cheap source of heat by storing up the solar heat. Perhaps, in like manner, the electric terrestrial currents may some day be made available.

LEAKAGE OF BOTTLES.

Mr. H. DUPRUE has invented a cork to prevent leakage from champagne. We have several times observed that bottles and demijohns containing liquors are subject to a curious sort of action, perhaps of an osmotic nature. Our readers may be aware that if a bladder containing water is immersed in a vessel of salt and water a process of *endosmosis* and exosmosis goes on through the membrane of the bladder until the inner and outer fluids are of the same specific gravity. It has been supposed that this transfusion would go on only through such membranes, but we claim the merit of discovering that it may take place in a most remarkable way through glass. To illustrate; we had in our closet a demijohn of Bourbon whisky, *of a medicinal character*. On the opposite side of a large room was a wash-stand with a pitcher or two of water and a mug. Little by little we observed that the contents of the water pitchers were transferred to the demijohn, while the water, at least when drank from the mug, had a noticable taste of whisky. We asked Bridget about it, and Bridget said she could not account for it at all unless it was the cat. Of course it wasn't the cat, so it must have been osmosis. If M. DUPRUE'S cork will stop this sort of thing we shall be deeply obliged to him; because our constitution, debilitated by severe editorial labors, requires the medicinal effect of Bourbon whisky not too much diluted.

THE EARNINGS OF THE PACIFIC RAILWAYS.

Secretary BOUTWELL'S financial statement of May 1 is said by the Washington correspondents to "enable the country to perceive at a glance the comparative capacity of the several subsidized lines to reimburse the government for aid extended." The Kansas road, formerly known as the eastern Division, on the route of the 35th parallel *via* Santa Fe, has so much traffic that one-half its earnings for carrying done by the United States alone, being the fifty per cent. reserved by law, has been nearly equal to the total interest on the bonds issued under authority of Congress to that company. The Central Pacific has reimbursed less than $75,000 out of the $1,500,000 accrued interest; and the Union Pacific about $775,000 out of $1,800,000.

A moment's consideration will show that this statement does not at all illustrate the "comparative capacity of the different lines" to pay the interest on the bonds loaned by

the government. It only shows to what extent the government itself is at this time employing each of these roads. Moreover, all this talk about the inability of the main line to pay, is not only premature, but suspiciously concerted and timed. Let us at least get one train across the continent before attempting to figure up the deficiencies of traffic. It is stupid to suppose that the freight or even the passenger business of the Pacific roads ought to begin to *pay* before it begins to *be*. Nobody anticipated larger dividends from construction trains.

An Addition to the Materia Medica.

A correspondent of the New York Farmers' Club, recommends stewed pumpkin as a cure for inflammatory rheumatism. Stewed pumpkin inclosed in pastry has long enjoyed a high reputation as a cure for an empty stomach, or on the homœopathic principle it might do something for an empty head. Perhaps the correspondent of the Farmers' Club will try it tor the last mentioned infirmity.

Scientific Hair Pulling.

The *Druggists' Circular* announces that ether spray is used at Lyons, France, to produce local anaesthesia when it is necessary to remove hair in cases of cutaneous diseases of the scalp. The operation of depilation is carried on so extensively in some of the French hospitals, that a number of men are kept constantly busy in pulling the hair of the patients, long practice enabling them to denude heads with wonderful rapidity and without causing much pain.

NEW PUBLICATIONS.

THE ANNUAL REPORT OF THE QUICKSILVER MINING COMPANY FOR 1868.

The report contains the usual statement of income and expenses, of no great interest except to the stockholders, to whom the document is addressed. The net income was $245,306 62, gold. The assets of the company amount to $572,175 85. The engineer reports a falling off of production from 50,035 cargas of ore in 1867 to 44,350¼ cargas in 1868, and he calls this an unfavorable result, in view of the fact that "all known ore-seams have been and are being vigorously worked." We do not see what there is in it for the company to regret, inasmuch as the contract of April, 1868, binds them to produce only 24,000 flasks of quicksilver annually, and they did produce, between April and December, 24,542 flasks. The falling off has been in the Santa Rita, San Francisco and Sacramento workings, and in the outside mines. The West Santa Rita and the Far West have improved greatly during the last year. On the whole, the difference between 1868 and 1869 may by set down as one of those fluctuations to which the mines of New Almaden have always been subject. They are frequently reported to be "falling off," and quite as frequently to be "looking better than ever."

ANNUAL REPORT OF THE COMMISSIONERS OF EMIGRATION OF THE STATE OF NEW YORK, *for the year ending December* 31, 1868.

There are a number of interesting points in this document, one or two of which we select for the information of our readers. The total number of passengers landed at this port, during the year 1868, was 272,421, of whom 213,686 were aliens. This is a decrease of 29,041 in alien immigration from that of the year 1867, but an increase of 22,421 on the average of the previous twenty years. Of the total number, 101,989 were from Germany, 47,571 from Ireland, 29,695 from England, and 34,431 from other countries, the most marked feature in the miscellaneous immigration being an increase of 10,000 Swedes from the last year. The number brought by steamers was 208,386, while only 32,194 came in sailing vessels, a disproportion which increases every year. On the steamers only 500 passengers died during the passage, but out of the comparatively small number of passengers on sailing ships there were 393 deaths.

The North German Union has co-operated with the United States Government to secure protection to emigrants, but Belgium has refused to make any such arrangements, and the result has been the destruction of the emigrant business at Antwerp. The apathy of the Belgian Government is one of the things which the commissioners find to regret, and several other grievances are mentioned, such as the delays on the railroads which carry emigrants west, some of the emigrant trains being obliged to give the right of way to freight trains; this of course increases the immigrants' expenses, and many cases of sickness are attributed to prolonged confinement in the cars. Another cause of suffering has been the want of a suitable building for the lunatic hospital on Ward's Island; but money has already been appropriated to supply this need. Then, in spite of the vigilance of the officers and employees of the commission, there are, of course, some cases of cruelty on vessels, and some instances where ignorant people are swindled or robbed. We have to thank the Commissioner of Emigration that these evils are exceptions to the rule, and not the rule itself.

FACTS CONCERNING THE TREATMENT OF SULPHURETS *for the Extraction of the Precious Metals. Published by the Gold and Silver Ore Separating Company, of the City of New York.* 1869.

The contents of this pamphlet are exceedingly unsatisfactory. They refer almost exclusively to a trial of the HAGAN furnace at the Enterprise mill in Alpine County, near Cisco, California, made last fall, and reported, we believe, after three days, to be a success. It is now six months since the said triumph was achieved; and we do not hear quite so much about it as we should naturally expect from the flourish with which the first performance was announced. Is it possible that circumstances have turned up since to dim the glory of that virgin success? The HAGAN process has failed so many times, to be frank about it, that we naturally look for better evidence of its final indication than the letters of San Francisco correspondents. Let us have several months' running of the Enterprise mill. If not, why not? This publication also contains the decision of a lawsuit which, it is claimed, establishes Mr. HAGAN as the first inventor of the process of desulphurization by means of heat and super-heated steam. We are told that "all the American and foreign patents having the least similarity to the patent of HAGAN were pleaded in the case, but the court held that HAGAN was the first inventor." Yet this gentleman only carries his invention back to the year 1858, and his caveats were filed in 1862! Those students of metallurgy who recollect how thoroughly the whole subject of the use of steam in roasting was investigated in Germany, will scarcely need to be told of the absurdity of this claim. Those who are less familiar with the facts may consult the pages of KERL's metallurgy (German edition) or the files of the AMERICAN JOURNAL OF MINING, which published, last year, a series of able articles, comprising a *resume* of the whole subject from the pen of Dr. OTT. With regard to the efficiency of the process, we believe it would be as great without steam as with it. The desulphurization in either case is not complete unless the ore is crushed beforehand, in which case a careful reverberatory roasting is the most thorough, and next to that probably the GERSTENHOFER Terrace Furnace. A furnace like Mr. HAGAN's appears to be merely a kiln on a more expensive scale. Of course it will produce better gross returns than the mill process, without any desulphurizing at all. The same may be said for all other contrivances which have infested the mining districts for the past five years. The true test for it is the running record for several months, with constant assays of tailings. The best metallurgists of California openly express the fear that auriferous pyrites cannot be desulphurized so as to leave them gold in a fit state for amalgamation. We still doubt this conclusion, and we shall be happy indeed if HAGAN'S, or any other process, can disprove it. But we hope there will be no more trying of experiments by hundreds of companies at once. Let us know *all* the facts; let us understand the circumstances and full extent of the "success" already achieved, and then we shall know when this process is to be chosen.

WHITE PINE SILVER MINES. MAP BY WILLIAM MUNT, *Civil and Mining Engineer.*

This map delineates with sufficient clearness and accuracy the Treasure Hill mines between Hamilton and Sherman Town, and contains also a chart of all the silver districts of Nevada, showing their relative positions. The Treasure Hill district is mapped out very fully, so as to exhibit the mines and mills, the roads, claims, hills, and the general geographical features of the place. There is a small table of distances from Hamilton to other localities; to Elko Station, on the Central Pacific Railroad, 110 miles; to Salt Lake, 270 miles; to San Francisco, 676 miles, etc. The finish is not such as to make it a model of cartography, but it is very well adapted to the purpose for which it was designed. It is conveniently folded and bound in a flexible cover. For sale in pocket-form by the American News Company, 119 Nassau street. Price $1.

ANSWERS TO CORRESPONDENTS.

S. J. K., OF VT.—A perceptible effect is produced upon the level of the ocean during the conjunction of sun and moon, by their united attraction. This effect results in the rise of the tides, also affects the weight of the earth's crust, causing it to resist with less power internal volcanic pressure, which is the reason that at those periods earthquakes, upheavals, and volcanic eruptions are found to be more common. A weight suspended on a spring is so infinitely small, compared with the mass of the whole earth, that the effect is imperceptible. A plumb-line suspended near the base of a mountain will, however, be attracted from the vertical position by the mass of the mountain, and the level of liquids deviated. Astronomical measurements have shown that this sometimes amounts to about half a degree.

S. T. V., OF VT.—In any recent extensive work on physics, you will find a full explanation of the cause of refraction of light. It has now been positively demonstrated to be due to the greater or less retardation of the propagation of the luminous waves through the different transparent media. In vacuo light is propagated with a velocity of nearly 200,000 miles per second; in air, 192,000; in water, 144,000; in glass, 125,000, and in diamond 77,000 miles per second. The laws of undulation, considered in all their particulars, are so complex that they cannot be understood without previous preparation by a thorough study of the higher mathematics. Consequently, to understand the theories of sound and light requires profound study, and they will always remain mysterious to those not scientifically initiated.

A. T. C., OF ———. If your blackboard is a real black board and not slate, it wants only recoating with the black varnish; but the lampblack and Japan varnish you propose will not do at all. It gives so smooth a coating that you can..ot write on it. The best blackboard varnish is made from alcohol, shellac, lampblack, and a little very fine emery. This gives a slightly gritty surface, very satisfactory for writing with chalk. If your chalk-marks do not rub out well, it shows that your surface is too gritty. Depriving your lampblack of oil by heating, as you propose, is absolutely useless.

H. D. D., OF TEXAS.—To bring water over a neck of land in syphons is one of those experiments which succeed on a small scale, but not otherwise. Of a large syphon, the lower, discharging, end should be immersed, otherwise the air gets in and the syphon stops flowing. Air will get in anyhow in a large syphon, and it is a necessary precaution to attach an air-pump to the highest portion in order to remove this air from time to time. In order to get power from your head of water, the only way will be to construct a small millpond at the lower side of your neck of land and keep the water in it by means of syphons, immersed at both ends, at the same height as it is in your headwater, and feed your water-wheel from this millpond.

C. F., OF OHIO.—Good white lead putty will not do at all for an aquarium. The lead and oil will poison your fish, even when you change the water several times before putting your fish in. Good common putty (chalk and oil), used very sparingly, is better covered up. It should be finely ground with hydraulic cement. We have used it with perfect success. We have also used the well-known aquarium cement, which is made of plaster of paris, sand, and litharge, equal measures made into a stiff putty with boiled oil. This cement, without any covering, has with us proved for years perfectly harmless to the fish and plants.

A. T. C., OF N. Y.—Castor oil is of course unfit for lubrication. Even when fresh it possesses the worst qualities possessed by the sperm, porpoise, olive or poppy oils, namely, it is gummy. Put your castor oil on your boots or old leather. It is excellent for this, but for lubricating purposes, by all means use only the natural or filtered heavy petroleum. The distilled lubricating petroleum or so-called paraffine oils are not so good, though for many purposes they are better than the sperm or lard oils in common use.

Original Papers.

[WRITTEN FOR THE AMERICAN JOURNAL OF MINING.]

REVIEW OF THE LITERATURE OF THE METALLURGY OF IRON.

BY PROF. PETER TUNNER, DIRECTOR OF THE SCHOOL OF MINES AT LEOBEN, AUSTRIA, AND LATE MEMBER OF THE JURY OF THE METALLURGICAL DEPARTMENT AT THE PARIS EXHIBITION OF 1867.

FROM THE GERMAN, BY DR. ADOLPH OTT.

[CONTINUED.]

Inventions and improvements in the department of iron-metallurgy are now following each other so rapidly that the periodicals and magazines which are devoted to this subject acquire great importance; and it is impossible for for a metallurgist to be versed in the modern improvements, if he does not attentively peruse at least one of these journals of the better class. There exists, as far as I know, no magazine which is exclusively devoted to the metallurgy of iron; but there are quite a number devoted to mining and metallury in general, and in most of them the metallurgy of iron occupies a considerable space. Passing over the discontinued periodicals, I will quote those only which are still published:

1. JERN-KONTORET'S *Annalen*, 1819–1368. This is decidedly the very best periodical on the subject in question, and I attribute its success chiefly to the circumstance that it was not started for the sake of making money. It is published by a committee of the most celebrated Swedish authorities, and at the expense of the Swedish Polytechnic Association. Contributors are well remunerated. It appears every two months, and it is only a pity that it is published in a language comparatively little understood.

2. *Oesterreichische Zeitschrift] fuer Berg- und Huettenwesen, Jahrgang*, 1853–1868. (Austrian Journal of Mining and Metallurgy). This periodical is published weekly, in one full printing sheet, sometimes with supplements and lithographic plates. Its value is particularly enhanced by the fact that it presents yearly an official report, with engravings, on the latest results in mining machinery and cognate departments.

3. *Berggeist, Zeitung fuer Berg-, und Huettenwesen, und Industrie, Jahrgang*, 1857–1868. (The Spirit of the Mountains, [*Gnome*] a Gazette for all Subjects Connected with Mining, Metallurgy and Industry). This is published at Cologne, on the Rhine, twice a week, in the size of half a printers' sheet, with numerous supplements.

4. *Zeitschrift fuer das Berg-Huetten-, und Salinenwesen in den Preussischen Staaten, Jahrgang*, 1854–1868. Journal of Mining, Metallurgy and Salines in the Prussian States). This periodical is published by the royal department of commerce, industry and public works, and appears four times a year in quarto. It devotes much space to statistics.

5. *Annales des Mines.* (French). There have been published, with but few interruptions, since the year 1806. Though in general very valuable, they offer little to the iron metallurgist. The same may also be said of the "*Bulletin de la Societie de l'Industrie Minerale.*"

6. *Berg- und Huetten-Mœnnische Zeitung, Jahrgang*, 1854–1868. (Mining and Metallurgical Gazette). This is published in Clausthal, [Leipzig—ED.] and appears yearly in fifty-two numbers, frequently with supplements and lithographic plates. It is chiefly devoted to the precious metals.

7. *Jahrbuch fuer den Berg- und Huettenmann, Jahrgang*, 1834–1868. (Year-book for the Mining Engineer and Metallurgist). This is published by the Royal Mining Academy at Freiberg, but is of little account to the iron metallurgist.

8. *Berg- and Huettenmaennisches Jahrbuch, Neue Folge, Jahrgang*, 1850–1868. (Annual for Mining and Metallurgy, New Series.) This journal is alternately edited by TUNNER, GRIMM and HALLER. In regard to the metallurgy of iron, it is principally represented by the author of this article, who begs his two fellow editors to excuse him for placing this periodical at the end of the list.

Before closing this article, I cannot forbear calling attention to a very wide spread error concerning the present condition of the science of the metallurgy of iron. While it is generally admitted that the mechanical, economical and commercial part of the iron business is of a more extensive, manifold and difficult character, and has in general reached a more accomplished state, than is the case with the other metals, there are yet many metallurgists who have the belief, dating from the times of father AGRICOLA, that the chemical part of the subject is comparatively very simple and easily looked over. The fact, however, is, that precisely in this science is the general lack of chemical knowledge most deeply felt, since the investigations to be made in this branch are of the most difficult character. The fact that iron appears as pig iron, steel and wrought iron, in three modifications, not differing widely in their chemical composition, and yet varying in their properties as if they were three entirely different metals, creates a necessity for exact chemical knowledge relating thereto, more imperative than has ever been felt with regard to the other metals. The insufficient explanations which are given by analytical chemistry, concerning the varying properties of pig iron, steel and wrought iron, have been the cause of numerous endeavors to ascribe the difference in the properties of those metals to mere changes in the molecular state of crystallization or molecular tension. While researches in this direction leave many phenomena still unexplained, it is beyond doubt that there is still a wide and fruitful field for analytical examinations.

In just appreciation of the existing want for chemical investigation, it has been determined by the iron masters of Westphalia and the Rhenish countries to establish a laboratory, especially devoted to chemical determinations of iron ores and their products. The Austrian Government also has called a number of young metallurgists to Vienna for a higher education in chemical metallurgy. Expectant VON LICHTENFELS is especially appointed for iron analyses. The acknowledgment of this great necessity is only of recent origin; and although it is true that the chemistry of iron has already overtaken that of the other metals, it cannot be denied that the immense increase in the production of iron, and the revolutions which this increase effected in the smelting and refining process, call in the most urgent manner for a greater and more exact chemical knowledge.

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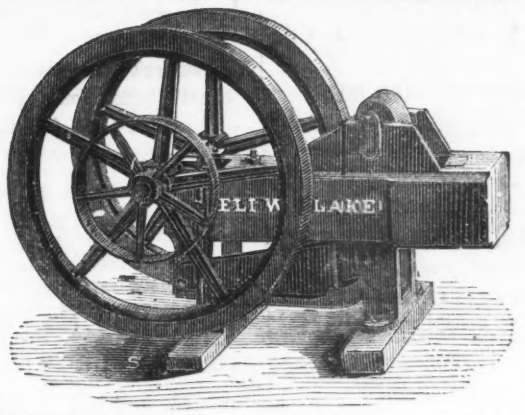

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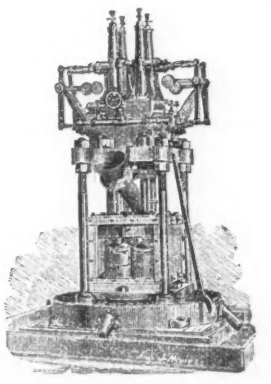

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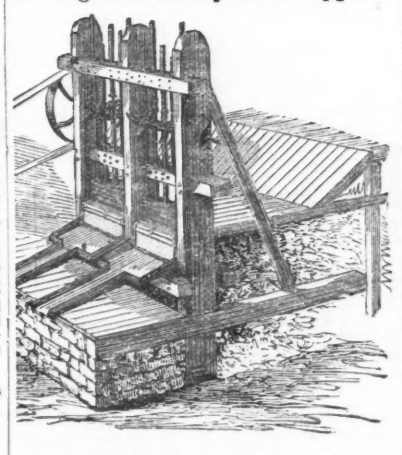

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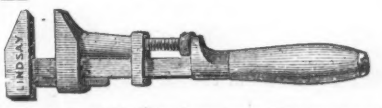

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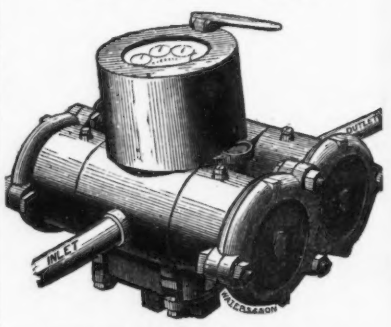

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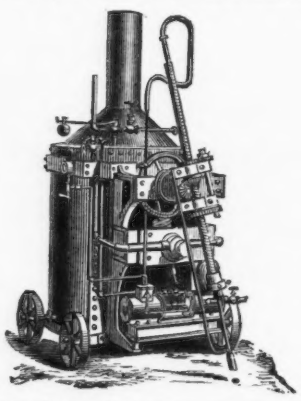

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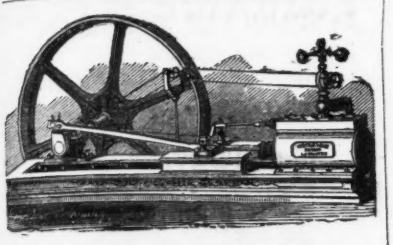

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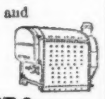

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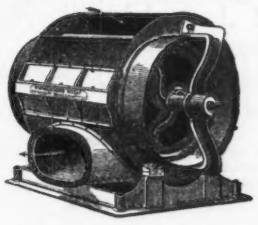

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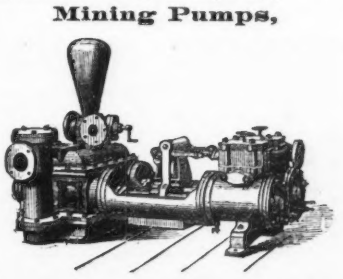

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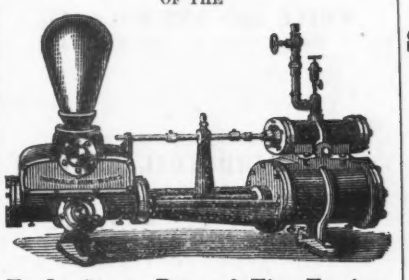

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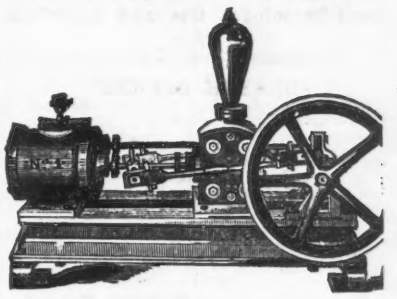

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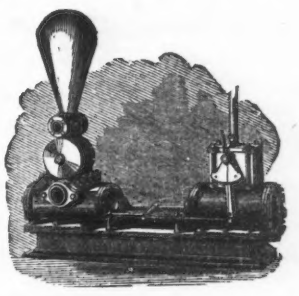

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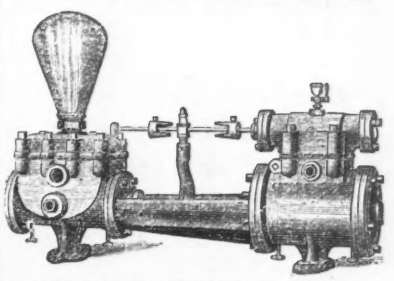

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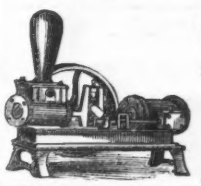

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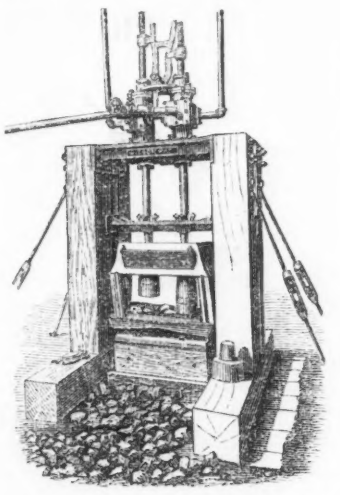

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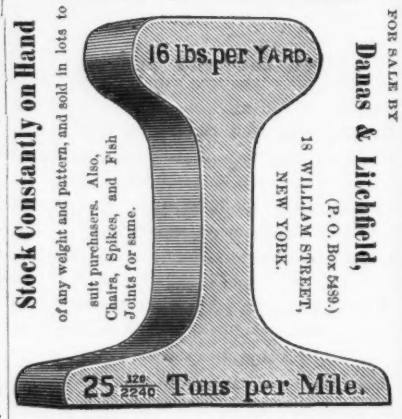

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